1941.

QUEENSLAND.

# FORTY-FIRST ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

IMPERIAL MYCOLOGICAL INSTITUTE
28 FEB 1942

## REPORT OF THE DIRECTOR

TO

## THE HON. THE SECRETARY FOR AGRICULTURE AND STOCK

(*As required by "The Sugar Experiment Stations Acts, 1900 to 1938"*).

PRESENTED TO PARLIAMENT BY COMMAND.

BRISBANE:
BY AUTHORITY: A. H. TUCKER, GOVERNMENT PRINTER.

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# FORTY-FIRST ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

## Director's Report.

### TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to submit the Forty-first Annual Report of The Bureau of Sugar Experiment Stations, covering the period 1st July, 1940, to 30th June, 1941.

H. W. KERR,
Director.

Brisbane, 1st November, 1941.

## GENERAL.

The growing season for the 1941 cane crop might be described as one of alternating extremes, and in this respect was similar to that of the previous year. Virtually all districts experienced an extremely dry spring and early summer followed by a prolonged wet season. Crops which were not advanced when the rains came suffered very much from lack of cultivation and waterlogging in the autumn of 1941.

The early planted crops in the far North gave good germinations and the scant storms which fell during November and December barely sufficed to maintain early growth until January, when heavy and continuous rains were recorded: wet conditions prevailed until June. This lead to early and profuse arrowing, which brought about an early check in growth as autumn advanced.

The Central districts were fortunate in receiving unusually favourable rain in August, but thereafter dry weather persisted until January. The wet season was then continuous until June, with exceptionally heavy rains in April. In this area, particularly, cultivation of backward crops was practically impossible after the wet season commenced.

The prolonged drought in the Southern districts was relieved by storms in November and December. Good growing conditions followed until early June, and these favourable rains enabled the backward crops to make up much of the leeway.

Cyclonic damage was this year only slight, in strong contrast with the 1940 experience. Following the disastrous cyclone and floods in the Burdekin district, in April, 1940, the crops of the area made a remarkable recovery, and the 1941 estimates are much in excess of peak quota tonnage requirements.

### CROP YIELD, 1940—CROP ESTIMATE, 1941.

The following table shows the individual mill crushings for the 1940 season, and the estimated crops available for harvest during 1941:—

| 1940 Crushing. | Mill. | 1941 Estimate. |
|---|---|---|
| 130,086 | Mossman | 135,000 |
| 226,763 | Hambledon | 227,000 |
| 247,584 | Mulgrave | 250,000 |
| 218,773 | Babinda | 234,000 |
| 185,145 | Goondi | 197,000 |
| 230,237 | South Johnstone | 260,000 |
| 183,123 | Mourilyan | 179,000 |
| 240,960 | Tully | 270,000 |
| 221,616 | Victoria | 248,000 |
| 187,792 | Macknade | 214,000 |
| 87,360 | Invicta | 100,000 |
| 157,701 | Pioneer | 191,300 |
| 178,749 | Kalamia | 220,000 |
| 192,729 | Inkerman | 276,000 |
| 151,450 | Proserpine | 147,000 |
| 83,044 | Cattle Creek | 83,000 |
| 177,593 | Racecourse | 164,000 |
| 180,640 | Farleigh | 163,000 |
| 117,819 | North Eton | 105,000 |
| 178,329 | Marian | 160,000 |
| 184,717 | Pleystowe | 163,000 |
| 201,268 | Plane Creek | 197,745 |
| 89,132 | Qunaba | 104,000 |
| 190,952 | Millaquin | 224,000 |
| 223,637 | Bingera | 240,000 |
| 213,489 | Fairymead | 245,000 |
| 57,116 | Gin Gin | 60,000 |
| 188,316 | Isis | 220,000 |
| 58,427 | Maryborough | 80,000 |
| 44,076 | Mount Bauple | 40,000 |
| 131,615 | Moreton | 160,000 |
| 18,500 | Rocky Point | 16,000 |
| 2,018 | Eagleby | 2,650 |
| 5,180,756 | Total | 5,575,695 |

### ESTIMATES OF SUGAR YIELD, 1941 CROP.

The preliminary estimate of the cane crop which is available for harvest in Queensland during 1941 is 5,575,695 tons. This is some 300,000 tons below the 1940 estimate. Moreover, since the proclamation acquiring the 1941 crops provides for acceptance of only that sugar manufactured within the 1939 peak quotas, certain districts will be obliged to stand over substantial areas of excess cane. It would appear that this necessity will arise only in the Southern districts, where the growth of the two-year cane is now standard practice, and in the Lower Burdekin district.

Allowing for short supply in those mill areas where there will not be sufficient cane to enable the peak quota of sugar to be manufactured, it seems probable that the 1941 tonnage will actually be little in excess of 700,000 tons 94 n.t. sugar.

### STATISTICS OF THE 1940 CROP.

The yield of raw sugar in Queensland for the 1940 crop was 759,446 tons* of 94 n.t. This is nearly 132,000 tons less than the all-time record tonnage manufactured during 1939.

The following table shows the geographical distribution of the crop for the past five years, as between "northern" and "southern" cane districts:—

SUGAR PRODUCTION, 1936–40.

| District. | 1936. | 1937. | 1938. | 1939. | 1940. |
|---|---|---|---|---|---|
| | Tons. | Tons. | Tons. | Tons. | Tons. |
| North of Townsville | 333,615 | 373,692 | 328,301 | 351,267 | 309,437 |
| South of Townsville | 410,646 | 389,633 | 449,835 | 540,155 | 450,009 |
| Total | 744,261 | 763,325 | 778,136 | 891,422 | 759,446 |

The 1940 tonnage for areas north of Townsville was the lowest since 1935, and while there is an even greater total reduction for the Central and Southern districts, in comparison with 1939 tonnages, the crop was actually the second largest manufactured in this section.

### ACRES HARVESTED AND ACREAGE YIELD.

The total area harvested for milling purposes in 1940 was 265,738 acres, which is 4,700 acres greater than that of the previous season. The acreages under plant, ratoon, and standover crops were as follows:—

| | Acres. |
|---|---|
| Plant cane | 96,130 |
| Ratoon cane | 150,749 |
| Standover cane | 18,859 |
| Total | 265,738 |

The yield of cane per acre crushed was 19.50 tons, while the average sugar yield was 2.86 tons. Having regard for the seasonal conditions, both figures must be considered satisfactory. This is the first time in five years that the yield of cane per acre has fallen below 20 tons, and the yield of sugar below 3 tons.

The following were the yields of cane and sugar per acre in the respective sugar districts, during 1940:—

ACREAGE YIELDS BY DISTRICT.

| District. | Tons Cane per acre. | Tons 94 n.t. Sugar per Acre. |
|---|---|---|
| Mossman-Ingham | 20·4 | 3·04 |
| Lower Burdekin | 22·9 | 3·21 |
| Proserpine | 14·2 | 2·18 |
| Mackay-St. Lawrence | 15·4 | 2·36 |
| Bundaberg-Gin Gin | 24·9 | 3·43 |
| Maryborough-Childers-Gympie | 18·6 | 2·71 |
| Nambour-Beenleigh | 25·5 | 3·39 |
| State Average | 19·50 | 2·86 |

* This is slightly in excess of the figure quoted on page 2, as it includes "local" sales which are additional to that acquired by the Sugar Board.

The following table gives the crop statistics for Queensland for the past ten years:—

TABLE SHOWING ACRES CULTIVALED AND HARVESTED, YIELDS OF CANE AND SUGAR, ACRE-YIELDS, AND QUALITY OF CANE, 1931–40.

| Year. | Acres Cultivated. | Acres Harvested. | Total Yields. | | Yields per Acre. | | Tons Cane to 1 Ton Sugar. |
|---|---|---|---|---|---|---|---|
| | | | Cane. | Sugar. | Cane. | Sugar. | |
| | | | Tons. | Tons. | Tons. | Tons. | Tons. |
| 1931 .. | 309,818 | 233,304 | 4,034,300 | 581,276 | 17·29 | 2·49 | 6·94 |
| 1932 .. | 291,136 | 205,046 | 3,546,443 | 514,085 | 17·30 | 2·51 | 6·90 |
| 1933 .. | 311,910 | 228,154 | 4,667,028 | 638,734 | 20·46 | 2·80 | 7·31 |
| 1934 .. | 303,916 | 218,426 | 4,269,991 | 612,570 | 19·56 | 2·80 | 6·97 |
| 1935 .. | 314,700 | 228,515 | 4,220,267 | 610,326 | 18·47 | 2·67 | 6·92 |
| 1936 .. | 338,686 | 245,152 | 5,171,516 | 744,261 | 21·10 | 3·04 | 6·94 |
| 1937 .. | 348,840 | 249,683 | 5,132,934 | 763,325 | 20·56 | 3·06 | 6·73 |
| 1938 .. | 347,199 | 251,064 | 5,342,085 | 778,136 | 21·28 | 3·10 | 6·87 |
| 1939 .. | 353,996 | 261,047 | 6,038,821 | 891,422 | 23·14 | 3·41 | 6·77 |
| 1940 .. | * | 265,738 | 5,180,756 | 759,446 | 19·50 | 2·86 | 6·82 |
| True Average for 10 Years .. | | 238,613 | 4,760,414 | 689,358 | 19·87 | 2·87 | 6·91 |

* Not available.

AVERAGE AREA HARVESTED PER FARM.

The following figures show the average acreage *harvested* by cane planters in Queensland for the 1939 crop:—

| | Acres. |
|---|---|
| Cairns to Townsville .. .. .. .. | 47 |
| Ayr to Mackay .. .. .. .. .. | 36 |
| Bundaberg to Bauple .. .. .. .. | 23 |
| Nambour to Beenleigh .. .. .. .. | 9 |
| State average .. .. .. .. | 33 |

The average area harvested per planter was 33 acres, which is one acre higher than that of the previous year.

MOLASSES PRODUCED.

The following table, compiled from data supplied by the Government Statistician shows the manner in which the molasses produced during the past ten years has been disposed of:—

| Method of Usage. | 1931. | 1932. | 1933. | 1934. | 1935. | 1936. | 1937. | 1938. | 1939. | 1940. |
|---|---|---|---|---|---|---|---|---|---|---|
| | Gallons. | Gallons. | Gallons. | Gallons. | Gallons. | Gallons. | Gallons. | Gallons. | Gallons. | Gallons. |
| Distilleries .. | 3,235,075 | 2,796,120 | 4,107,566 | 4,573,037 | 4,617,431 | 6,086,864 | 7,071,109 | 8,275,887 | 9,581,241 | 11,531,396 |
| Fertilizer .. | 1,753,086 | 1,414,338 | 1,793,101 | 2,227,905 | 2,559,528 | 3,211,423 | 3,363,624 | 3,293,543 | 4,295,289 | 3,334,372 |
| Stock Feed .. | 2,940,551 | 2,988,905 | 2,902,188 | 3,035,598 | 3,817,755 | 4,351,822 | 3,914,113 | 4,237,196 | 4,727,170 | 5,380,242 |
| Mill Fuel .. | 7,075,965 | 6,182,769 | 7,348,015 | 5,339,489 | 4,103,475 | 6,354,841 | 5,576,764 | 3,748,590 | 3,834,653 | 1,781,425 |
| Other Purposes .. | 47,276 | 108,122 | 340,928 | 444,680 | 175,519 | 397,080 | 157,496 | 232,049 | 188,889 | 228,450 |
| To Waste .. | 910,418 | 1,402,483 | 1,747,365 | 1,162,715 | 1,214,678 | 560,326 | 466,481 | 498,926 | 457,541 | 47,069 |
| Total .. | 15,962,371 | 14,892,737 | 18,239,163 | 16,783,424 | 16,488,386 | 20,962,356 | 20,549,587 | 20,286,191 | 23,084,783 | 22,302,954 |

The major trends in molasses utilization during recent years are the increased amounts devoted to distillery use and the reduction of the proportions used as mill fuel and run to waste. The lastnamed item is now insignificant.

MAFFRA BEET FACTORY.

The following data in respect of the Maffra Sugar Factory, Victoria, are supplied through the courtesy of the Manager:—

CROP YIELDS, 1941 SEASON.

| | |
|---|---|
| Area harvested .. .. .. | 3,499 acres |
| Beet purchased .. .. .. | 27,031 tons |
| Beet sliced .. .. .. .. | 26,179 tons |
| Average sugar content .. .. | 16·29 per cent. |
| Sugar produced .. .. .. | 3,279 tons |
| Price paid for beet .. .. .. | 44/– |
| Average yield beet per acre .. | 7·72 tons |
| Average yield refined sugar per acre | 0·936 tons |

1940 SUGAR VALUES.

The proportion of the 1940 sugar crop manufactured in Queensland, which was required for consumption and use in the Commonwealth of Australia, was declared at 53.6019 per cent., and that for export at 46.3981 per cent. These proportions are exclusive of the "excess" sugar produced by mills in excess of their allotments under the 1939 Peak Year quotas. The excess of sugar produced for the 1940 season was 58,680 tons, as compared with 168,719 tons in 1939.

The price payable for the sugar required for consumption and use in Australia was declared at £23 1s. per ton of 94 net titre. The net value per ton of 94 net titre sugar sold abroad was £11 5s. 6d., which is 18s. per ton higher than the 1939 figure. The average price paid to those Queensland mills which did not produce "excess" sugar was £17 11s. 9d. per ton, compared with £16 19s. 7d. for the previous season. The average value of *all* sugar was £17 2s. 8d., which is the highest recorded since 1932.

The following table summarises production and consumption figures and sugar values since the year 1924, when the first large surplus was produced:—

| Year. | Total Sugar Production at 94 n.t. | Tons Sugar Exported.* | Average Australian Price. | Average Export Price. | Average Price, No. 1 Pool Sugar. | Average Price, *all* Sugar. |
|---|---|---|---|---|---|---|
| | Tons. | Tons. | £ | £ | £ | £ |
| 1924 .. .. | 409,136 | 74,000 | 26·0 | 21·0 | 26·0 | 26·0 |
| 1925 .. .. | 485,585 | 219,000 | 26·5 | 11·3 | 19·5 | 19·5 |
| 1926 .. .. | 389,272 | 74,777 | 26·5 | 14·9 | 24·5 | 24·5 |
| 1927 .. .. | 485,745 | 152,384 | 26·5 | 12·1 | 22·0 | 22·0 |
| 1928 .. .. | 520,620 | 186,703 | 26·5 | 10·5 | 20·9 | 20·9 |
| 1929 .. .. | 518,516 | 197,000 | 27·0 | 9·9 | 20·3 | 20·3 |
| 1930 .. .. | 516,783 | 203,605 | 27·0 | 8·3 | 19·7 | †19·5 |
| 1931 .. .. | 581,276 | 291,802 | 27·0 | 9·4 | 18·3 | 18·0 |
| 1932 .. .. | 514,027 | 189,733 | 25·0 | 8·3 | 19·3 | 18·8 |
| 1933 .. .. | 638,734 | 305,687 | 24·0 | 8·0 | 17·2 | 16·2 |
| 1934 .. .. | 612,570 | 277,336 | 24·0 | 7·6 | 16·5 | 15·5 |
| 1935 .. .. | 610,326 | 298,202 | 24·0 | 7·9 | 16·9 | 16·2 |
| 1936 .. .. | 744,261 | 409,400 | 24·1 | 7·95 | 17·1 | 15·2 |
| 1937 .. .. | 762,794 | 430,523 | 24·0 | 8·3 | 17·55 | 15·3 |
| 1938 .. .. | 776,810 | 443,386 | 24·0 | 8·2 | 16·95 | 15·1 |
| 1939 .. .. | 890,896 | 515,792 | 23·6 | 10·4 | 17·0 | ‡15·75 |
| 1940 .. .. | 758,952 | 373,489 | 23.05 | 11.3 | 17.6 | 17.1 |

* Bagged sugar. † Peak Year Scheme first operated in 1930.
‡ Revised Mill Peak schedule first operated in 1939.

TOTAL VALUE, 1940 SUGAR CROP.

The total value of the 1940 Queensland crop was £13,000,000, which is one million less than the all-time record value of 1939.

## ECONOMIC REVIEW.

Despite difficulties, the 1940 sugar crop was successfully disposed of, although the last portion of the sugar was shipped only just before the commencement of the 1941 harvesting season. The tonnage manufactured was substantially below that of the previous year, and must be regarded as a subnormal yield in the light of recent performances. Wind and flood damage took a heavy toll of the crop, especially in the Lower Burdekin district. However, the average value realised for all sugar was substantially above recent levels, and compensated in a measure for these losses and rising costs of many essential items.

The 1941 crushing season was launched in an air of great uncertainty. The shipping problem had been a difficult one in 1940: this year it is virtually impossible to predict the future with any degree of surety. In anticipation of the availability of overseas ships in June, the Government appealed to all mills to make an early start with their crushing, wherever possible. As a measure of compensation for losses to growers and increased manufacturing charges to the mills, a bonus payment varying from 30s. to 20s. per ton was made on sugar manufactured during the month of June. Several mills were able to make an early start: these were mostly in the Northern part of the State.

By proclamation, the Government decided to acquire all sugar manufactured within the 1939 Peak Year quotas. Due to unfavourable seasonal conditions, several mills in the Central and Northern districts will not be able to fill their quotas. The Lower Burdekin mills and the large units in the Southern areas have, however, crops substantially in excess of requirements, and these will be allowed to stand in the field. The actual No. 1 Pool sugar manufactured should be very little in excess of 700,000 tons, but the marketing of even this reduced tonnage will involve major difficulties. Negotiations are taking place for the sale of the export quota to Great Britain, Canada, and New Zealand. A further proportion of the potential export is also to be employed for the maufacture of power alcohol, to enable existing distilleries to be maintained at maximum production levels. It is hoped that these outlets, combined with the plan to store additional emergency food supplies in this country, may serve to relieve the position. But it is fully anticipated that the problem of transporting the export sugar to its destination will necessitate long storage for much of the crop. All mills have, therefore, made further additions to their sugar stores, even where their capacity had been augmented in 1940. Crop delivery prices have had to be fixed at an exceptionally low figure this season, in view of probable marketing delays, and the question of finance will constitute a major difficulty to growers especially.

On the cane production side a further complication arises, due to the short supply of essential fertilizers. For the second season it has become necessary to ration potash supplies, while this year the superphosphate and sulphate of ammonia available are quite inadequate for normal requirements. Attempts have been made to allocate probable supplies amongst those industries which stand in greatest need of these aids to production, or which are producing crops urgently required for war purposes.

Admittedly, it is desirable to regulate crop production to the needs of probable market availability; but it is also uneconomic to effect this by cutting down on the utilization of plant-food supplies. Intensification of production has been the keynote of success in the sugar industry during recent years, and the sugar industry has become the country's most extensive consumer of sulphate of ammonia and potash, since it has been recognised that the soils of the coast can only be made to produce economically where these materials are correctly employed. In many centres the production of profitable ratoon crops is possible only where adequate applications of nitrogenous manures can be obtained; therefore, the drastic cut in sulphate of ammonia quotas will be reflected in reduced crop yields per acre, which will lead to increased production costs.

Since the beginning of the war the Bureau has urged all canegrowers to guard against the development of such conditions by the consistent practice of green manuring all fallow land with legume crops. Experience has shown that normal plant cane crops in Queensland do not need supplementary nitrogen where this has been followed, and the total supply of sulphate of ammonia may then be reserved for ratoon cane. Farmers have not been slow to follow this advice; but even with the full exploitation of this expedient, difficulties which may prove particularly stubborn face the canegrower.

In an effort to rationalise production between individual canegrowers, many further districts have this year invoked the aid of the farm peak quota plan. It is confidently anticipated that such a policy will at least make for sounder crop planning, and assure that the farmer, who wishes to keep his production within bounds will not incur a penalty thereby. Moreover, the reduced acreage necessary for the growth of a smaller aggregate tonnage will permit the farmer to give his poorer land the benefits of a long fallow policy, and thus pave the way for profitable crop returns without the necessity for undue fertilizer purchases.

## WORK OF THE BUREAU.

The detailed reports of the officers in charge of the several Divisions and regional Experiment Stations will be found in the ensuing pages of this Report. The following general comments embody the more important aspects of the activities of the Bureau for the year under review:—

*Advisory Board.*

A new Board was elected during the year, and took office as from the 1st April, 1941. The only change in personnel was the replacement of Mr. C. W. Thiele (Southern Growers' representative) by Mr. B. Foley, and the Board is constituted as follows:—

Hon. F. W. Bulcock, Minister for Agriculture, *Chairman*;
Mr. N. H. Wellard, Northern Growers' Representative, *Vice-Chairman*;
Mr. B. Foley, Southern Growers' representative;
Mr. J. Smith and Mr. A. V. Thorp, Millers' representatives; and
Dr. H. W. Kerr, Director of the Bureau.

*Meetings.*—Four meetings of the Board were held, as follows:—19th August, 1940, and 8th March, 1941, in Brisbane; 6th November, 1940, in Innisfail, and 19th June, 1941, in Mackay.

*Staff.*—Messrs. R. A. Abbott and E. A. Pembroke were appointed as cadets on the field staff during the year. These appointments are regarded as additions to bring this service to effective working strength, but the work of this branch is still seriously affected by the absence of four of its members on active service. Mr. S. O. Skinner joined the A.I.F. during the year.

*Disease and Pest Control.*—The Advisory Board has devoted further close attention to the operations of the Act in so far as it affects the control of pests and diseases. In order to simplify this work and to remove minor anomalies, the Board has endorsed an amending Bill, which it is proposed should be introduced during the forthcoming Parliamentary session. Control Boards have generally operated successfully during the past year, and it is safe to conclude that neither pests nor diseases will become a major menace in the future, now that adequate safeguards are being taken to prevent such a contingency arising.

*Experiment Station Field Days.*—These were conducted at each of the three stations. The Meringa function was held in conjunction with the Agricultural Session of the Queensland Society of Sugar Cane Technologists, and the Hon. the Minister favoured the gathering by attending and giving a very interesting and informative address. Mr. Bulcock was also present at the Mackay Field Day, held in June, 1941.

*New Cane Varieties.*—Further seedling canes propagated by the Bureau and new varieties introduced from New South Wales and overseas have been tested in farm yield trials during the year. Certain of these have proven worthy of more expansive tests, and have been propagated accordingly.

*Levy.*—The levy for the year 1941-42 was fixed at ¾d. per ton of cane, as in the previous year.

*Fertilizer Supplies.*—This problem has been the subject of much concern, and an attempt has been made to allot available supplies of each plantfood equitably amongst the farmers who stand in greatest need of the respective constituents.

*Sugar Agriculture and Tractor School.*—Over eighty young cane farmers attended the School, which was held at Gatton College in January, 1941. The function was a complete success, and the industry has expressed the desire that it be repeated as an annual event. It is hoped that conditions will permit of this being effected.

"THE SUGAR EXPERIMENT STATIONS ACTS, 1900-1938."

SUGAR FUND.

STATEMENT OF RECEIPTS AND DISBURSEMENTS FROM 1ST JULY, 1940, TO 30TH JUNE, 1941.

| RECEIPTS. | £ | s. | d. |
|---|---|---|---|
| To Balance .. | 21,502 | 17 | 10 |
| ,, Assessments | 16,191 | 9 | 10 |
| ,, Endowment | 7,000 | 0 | 0 |
| ,, Bundaberg | 1,607 | 12 | 0 |
| ,, Mackay .. | 1,041 | 15 | 7 |
| ,, Meringa | 870 | 14 | 6 |
| ,, Sundries.. | 115 | 4 | 3 |
| | £48,329 | 14 | 0 |

| DISBURSEMENTS. | £ | s. | d. |
|---|---|---|---|
| By Salaries .. | 11,298 | 5 | 0 |
| ,, Contingencies .. | 7,216 | 13 | 3 |
| ,, Bundaberg Contingencies | 1,631 | 10 | 0 |
| ,, Mackay Contingencies | 2,013 | 9 | 5 |
| ,, Meringa Contingencies | 1,816 | 3 | 5 |
| ,, Balance .. | 24,353 | 12 | 11 |
| | £48,329 | 14 | 0 |

STATEMENT OF RECEIPTS AND DISBURSEMENTS FROM INCEPTION OF FUND, 1ST DECEMBER, 1900, TO 30TH JUNE, 1941.

| RECEIPTS. | £ | s. | d. |
|---|---|---|---|
| To Assessments | 285,149 | 17 | 2 |
| ,, Endowment | 213,199 | 1 | 7 |
| ,, Sugar Experiment Stations | 57,160 | 1 | 2 |
| | £555,508 | 19 | 11 |

| DISBURSEMENTS. | £ | s. | d. |
|---|---|---|---|
| By Disbursements .. | 531,155 | 7 | 0 |
| ,, Balance .. | 24,353 | 12 | 11 |
| | £555,508 | 19 | 11 |

C.C.S. FORMULA.

For the benefit of overseas readers of this report, we would point out that the measure of available sugar in cane (so-called Commercial Cane Sugar or C.C.S.) is defined as follows:—

$$\text{C.C.S. in juice} = \text{Pol in juice} - \frac{\text{Impurities in juice}}{2}$$

and C.C.S. in cane is calculated by the formula:—

$$\text{C.C.S.} = \frac{3P}{2}\left(1 - \frac{5 + F}{100}\right) - \frac{B}{2}\left(1 - \frac{3 + F}{100}\right)$$

where—P = pol in first expressed juice
B = brix in first expressed juice
F = fibre in cane.

# DIVISION OF SOILS AND AGRICULTURE.

## WORK OF THE BRISBANE LABORATORY.

Mr. C. R. von Stieglitz, Chemist.

*Routine Analyses.*—The following is a summary of the routine analyses performed at the Brisbane Laboratory for the period 1st July, 1940, to 30th June, 1941:—

| | |
|---|---|
| Soils | 714 |
| Waters | 33 |
| Sugar canes | 23 |
| Filter muds | 16 |
| Molasses | 2 |
| Fertilizers | 2 |
| Limes | 1 |
| Basic lead acetates | 2 |
| Ash | 1 |
| Miscellaneous | 8 |
| Total | 802 |

This represents an increase of 192 samples on the previous year's figures. Portion of this increase is due to the despatch to Brisbane of certain soil samples from the far Northern areas, which would normally have been analysed at Meringa. This was rendered necessary owing to the enlistment in the R.A.A.F. of Mr. G. A. Christie.

Approximately 50 per cent. of the soil samples received were from farmers requiring advice as to the correct fertilizer to apply. Although this represents an increase on previous years, it is surprising how few farmers have availed themselves of this free service.

*Laboratory Training of Field Officers.*—Messrs. Pembroke and Abbott, two new appointees as cadets to the field staff, and Mr. Smith, who was appointed last year, spent several months in the Brisbane laboratory receiving instructions in the simpler routine methods of soil analysis and in carrying out experiments designed to illustrate the different physical, chemical, and biological properties of certain major soil types.

*Investigational Work.*—The following papers were published during the year:—

"Methods for Evaluating Certain Reagents used in Factory Control," by C. R. von Stieglitz, Proceedings of the Queensland Society of Sugar Cane Technologists, 12th Annual Conference; and

"The Values of Green Manure Crops," by N. G. Cassidy, Cane Growers' Quarterly Bulletin, Vol. VIII, No. 3.

*Soil Fertility Survey.*—In collaboration with Mr. Knust, Instructor in Cane Culture, a fertility survey was commenced in the Garradunga area. Fields carrying mature plant crops were analysed for pH, available phosphate, replaceable potash, and total replaceable bases. These results have now been mapped.

*Monthly Variation of Available Plantfoods and pH.*—For this investigation five different soil types were selected for study, three from the high rainfall belt near Innisfail, one at Mackay, and one at Bundaberg.

The fields carrying crops of cane were sampled each month at 0-10 inches and 10-20 inches depth and the soils analysed for pH, available phosphate, and replaceable potash. Available phosphate and pH (KCl suspension) have remained fairly constant throughout, but considerable variation is evident in the figures for replaceable potash. There is little evidence in the results to hand of leaching of potash in the soils studied, but a general tendency to build up replaceable potash in the dryer months is shown for all types. In certain soils the growing conditions appear to affect this figure markedly. The study is being continued and should provide much interesting data by next year.

### Laboratory Methods of Assessing Available Plant Nutrients.

Laboratory results for available soil phosphate and potash were compared as usual with the results of fertilizer field trials and resulted in agreement in seven out of nine cases for phosphate and eight out of ten for potash for the 1940 trials. Including the results from first and second ratoon trials, agreement was found in 76 per cent. of the phosphate tests and in 86 per cent. of the potash.

Andrews' nitrogen availability test, modified somewhat, has been applied now to 39 soils from field trials and a positive correlation obtained in 74 per cent. of the cases. The test would appear to have possibilities in determining the probable reaction of the plant crop to nitrogenous fertilizers. It is hoped to continue this work in the coming year.

## NORTHERN SUGAR EXPERIMENT STATION, MERINGA.

### METEOROLOGICAL AND NOTES ON CROP GROWTH.

The spring of the 1940-41 growing period was a replica of that of the previous year, and there was an almost complete absence of useful rains until the November thunderstorm period. Any plantings that were made reasonably early in the spring had to rely on the moisture already conserved from the previous wet season rains.

In addition to this disadvantage, such plantings had a succession of fairly cold night temperatures until the end of September, and as a consequence germinations were rather slow. Since only two inches of rain fell in November and sixty points in December, actually very little growth occurred until the wet season commenced in January. Rain fell then with little intermission until May, with the result that low-lying fields were for months in a water-logged condition. High winds combined with heavy rains about the early April period caused considerable lodging of well-advanced crops in many parts. Although the total rainfall was not as great as in some other years, this season stands out as a record for the number of wet days experienced since meteorological readings were commenced at this station.

Unfortunately, the continual wet weather prevented the preparation of the ground for any early plantings on the station for the 1941-42 programme, and temperatures had become low by the time the soil had dried out sufficiently to work.

Ratoons from early cut cane in the 1940 season were slow in coming away, due also to wet soil conditions and low temperatures, but as the temperature rose the growth became more rapid and they made good progress until checked in growth by dry summer conditions.

As a result of the continued wet, profuse arrowing occurred throughout the district from early May onwards, and large areas of varieites such as Korpi and Oramboo, which usually do not arrow freely, were to be seen in flower; a good deal of Badila also arrowed.

Abstract of Meteorological Observations made at the Northern Sugar Experiment Station, Meringa, from 1st July, 1940, to 30th June, 1941.

| Month. | Rainfall in Inches. | Number of Wet Days. | Highest Shade Maximum. | Lowest Shade Maximum. | Mean Shade Maximum. | Highest Shade Minimum. | Lowest Shade Minimum. | Mean Shade Minimum. | Mean Diurnal Range. | Mean Temperature 9 a.m. | Mean Relative Humidity 9 a.m. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1940. | | | | | | | | | | | |
| July | 0·72 | 6 | 82·0 | 73·8 | 78·9 | 63·5 | 42·2 | 56·1 | 22·7 | 68·9 | 79 |
| August | 0·46 | 9 | 86·5 | 75·8 | 81·4 | 66·0 | 48·0 | 57·7 | 23·7 | 71·2 | 78 |
| September | 0·10 | 3 | 93·2 | 81·0 | 85·8 | 63·9 | 45·2 | 56·9 | 28·8 | 76·3 | 65 |
| October | 0·92 | 6 | 93·7 | 78·8 | 87·8 | 67·0 | 53·5 | 60·9 | 26·8 | 79·0 | 61 |
| November | 2·28 | 5 | 96·8 | 85·5 | 92·4 | 78·0 | 56·0 | 69·0 | 23·8 | 84·0 | 62 |
| December | 0·63 | 5 | 109·0 | 90·0 | 94·4 | 75·4 | 66·2 | 71·2 | 23·2 | 86·2 | 61 |
| 1941. | | | | | | | | | | | |
| January | 12·17 | 25 | 101·6 | 80·4 | 91·2 | 78·3 | 69·0 | 74·3 | 16·9 | 83·2 | 78 |
| February | 24·22 | 19 | 95·0 | 82·4 | 88·5 | 75·4 | 67·0 | 71·3 | 17·2 | 80·7 | 83 |
| March | 15·40 | 23 | 94·0 | 79·3 | 88·6 | 77·2 | 69·6 | 73·6 | 15·1 | 81·5 | 86 |
| April | 18·67 | 26 | 89·0 | 77·2 | 83·4 | 76·2 | 60·6 | 69·5 | 13·6 | 76·7 | 87 |
| May | 4·77 | 27 | 83·5 | 72·1 | 80·0 | 70·4 | 55·6 | 65·4 | 14·6 | 73·9 | 86 |
| June | 0·25 | 4 | 86·6 | 74·0 | 79·3 | 67·2 | 43·0 | 56·8 | 22·2 | 69·7 | 81 |
| Totals | 80·59 | 158 | .. | .. | .. | .. | .. | .. | .. | .. | .. |

In spite of the prolonged wet weather and the early date on which the mills began crushing, the cane produced a fair C.C.S., which rose rapidly with the advent of cold nights and clear days in June. Possibly the large amount of grub-damaged cane in parts of the area contributed to the high early C.C.S.

The following are the rainfall records taken on this station during the last 21 years:—

| Year. | Rainfall in Inches. | Year. | Rainfall in Inches. |
|---|---|---|---|
| 1921 | 122·84 | 1932 | 76·31 |
| 1922 | 64·90 | 1933 | 96·06 |
| 1923 | 53·29 | 1934 | 91·44 |
| 1924 | 95·67 | 1935 | 59·91 |
| 1925 | 76·98 | 1936 | 88·81 |
| 1926 | 59·12 | 1937 | 46·33 |
| 1927 | 90·16 | 1938 | 55·86 |
| 1928 | 66·33 | 1939 | 118·08 |
| 1929 | 102·28 | 1940 | 84·58 |
| 1930 | 107·61 | 1941 (6 months) | 75·48 |
| 1931 | 98·82 | Average, 25 years | 81·78 |

## VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

| | | | | |
|---|---|---|---|---|
| G.113 | S.J.4 | G.243 | G.126 | H.248 |
| 30.6 | 32.9 | 36.6 | 38.2 | 22.6 |
| H.248 | G.243 | G.126 | G.113 | S.J.4 |
| 30.3 | 34.4 | 44.4 | 35.3 | 37.0 |
| S.J.4 | H.248 | G.113 | G.243 | G.126 |
| 28.8 | 25.2 | 29.6 | 30.4 | 38.8 |
| G.243 | G.126 | S.J.4 | H.248 | G.113 |
| 34.6 | 39.0 | 35.1 | 24.3 | 29.6 |
| G.126 | G.113 | H.248 | S.J.4 | G.243 |
| 39.7 | 35.8 | 31.9 | 38.8 | 33.7 |

*Block.*—A3.
*Harvested.*—Mid-September, 1940.
*Age of Crop.*—14 months.
*Plan.*—Latin square (5 × 5).
*Plots.*—$\frac{1}{20}$ acre, with guard rows of S.J.4.

CROP YIELDS.

| Variety. | Cane per Acre. | C.C.S. in Cane. |
|---|---|---|
| | Tons. | Per cent. |
| G.113 | 32.2 | 13.8 |
| G.126 (Q.44) | 40.0 | 15.9 |
| G.243 | 33.9 | 15.9 |
| H.248 | 26.9 | 14.8 |
| S.J.4 | 34.5 | 14.8 |

### DISCUSSION.

Prior to planting, a good crop of Gambia pea was turned in and the plot received 4 cwt. of Sugar Bureau No. 1 planting mixture per acre. As evidenced by the plan, the variety G.126 (now Q.44) outyielded the other varieties in every plot, and at the time of harvest the C.C.S. was a unit superior to that of the standard S.J.4. The growth of G.126 was very uniform, and the average yield of 40 tons per acre on rather poor forest soil must be regarded as excellent. This trial was ploughed out after harvest in accordance with our plan for removing all S.J.4, a gum susceptible variety, from the station.

## OBSERVATIONAL VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

| | | |
|---|---|---|
| J.30 | J.31 | S.J.4 |
| 20.0 | 27.3 | 28.8 |
| S.J.4 | I.118 | J.14 |
| 22.4 | 33.6 | 30.0 |
| J.39 | I.67 | I.41 |
| 18.9 | 20.8 | 21.6 |
| J.37 | S.J.4 | I.16 |
| 24.0 | 26.6 | 21.3 |
| J.18 | I.128 | I.12 |
| 22.8 | 28.0 | 14.1 |
| S.J.4 | I.136 | I.117 |
| 25.2 | 33.3 | 29.5 |
| J.13 | J.25 | S.J.4 |
| 32.1 | 28.4 | 29.1 |

*Block.*—A.4.
*Harvested.*—Early October, 1940.
*Age of Crop.*—14 months.
*Plots.*—$\frac{1}{20}$ acre.

### DISCUSSION.

The piece of land on which this trial was planted was newly cleared ground, consisting of very poor clayey soil with some small patches of better ground. It was, therefore, to be expected that growth would be patchy, as indeed was the case, and this rendered the results of the trial very erratic. During the dry spring practically no early growth took place at all and the yields generally were poor.

After some of the varieties had been eliminated due to low sugar content, or to their unfavourable reaction to downy mildew and/or leaf-scald diseases, the following were chosen to be planted in a Latin Square trial:—I.41, I.118, J.37, and J.39.

This trial similarly was ploughed out for the dual purpose of eliminating the gum-susceptible variety S.J.4, and also in order to attempt to iron out soil irregularities by a programme of further green manuring and fallowing.

CROP YIELDS.

| Variety. | Cane per Acre. | C.C.S. in Cane. |
|---|---|---|
| | Tons. | Per cent. |
| I.117 | 29·5 | 15·9 |
| I.12 | 14·1 | 14·1 |
| I.16 | 21·3 | 18·1 |
| I.41 | 21·6 | 16·8 |
| J.14 | 30·0 | 14·2 |
| J.25 | 28·4 | 15·1 |
| I.136 | 33·3 | 15·5 |
| I.128 | 28·0 | 17·9 |
| I.67 | 20·8 | 18·8 |
| I.118 | 33·6 | 16·7 |
| J.31 | 27·3 | 16·1 |
| J.13 | 32·1 | 15·0 |
| J.18 | 22·8 | 12·3 |
| J.37 | 24·0 | 16·4 |
| J.39 | 18·9 | 17·1 |
| J.30 | 20·0 | 15·2 |
| S.J.4 (5 plots) | 26·4 | 15·9 |

## OBSERVATIONAL VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

| | | |
|---|---|---|
| G.140 | G.118 | S.J.4 |
| 28.8 | 29.9 | 23.4 |
| S.J.4 | H.248 | G.113 |
| 27.8 | 22.0 | 23.3 |
| G.126 | S.J.4 | G.243 |
| 26.4 | 21.2 | 17.5 |

*Block.*—B1.
*Harvested.*—October, 1940.
*Age of Crop.*—10½ months.
*Plots.*—$\frac{1}{20}$ acre.

### DISCUSSION.

After the plant crop was harvested in 1939, the trash was conserved by rolling in alternate rows. Bare rows were grubbed and Sugar Bureau No. 1 ratooning mixture was applied at the rate of 4 cwt. per acre followed later by a top dressing of 300 lb. per acre of sulphate of ammonia.

The varieties generally ratooned well, but owing to the lateness of their harvest in the plant crop, the ratoons were backward when they encountered the severe wet season conditions and the soil remained more or less waterlogged for months. This caused early arrowing, but considering the short growing period, the results from the 10½ months old crop must be considered as most satisfactory.

SUMMARY OF YIELDS—PLANT AND FIRST RATOON CROPS.

| Variety. | Plant Crop. | | First Ratoon Crop. | |
|---|---|---|---|---|
| | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. |
| | Tons. | Per cent. | Tons. | Per cent. |
| G.113 | 27·4 | 15·0 | 23·3 | 13·8 |
| G.118 | 37·4 | 14·5 | 29·9 | 15·1 |
| G.126 | 31·4 | 17·8 | 26·4 | 17·1 |
| G.140 | 38·0 | 16·8 | 28·8 | 15·9 |
| G.243 | 24·4 | 18·6 | 17·5 | 18·9 |
| H.248 | 28·6 | 15·5 | 22·0 | 14·8 |
| S.J.4 (3 plots) | 32·6 | 17·0 | 24·1 | 16·7 |

### Land Clearing, New Plantings, and Drainage.

During the year the remainder of Division A, an area of about half an acre, was cleared, ploughed, and planted to green manure, and a further small area, broken by creeks and drains, was also stumped and brought under the plough; this latter area will be utilized for the planting of wild species of cane which are used in breeding but which become a nuisance when planted among other millable varieties.

A piece of wet ground on the eastern boundary of the farm, approximately 0.7 acre in area, was planted entirely to canes for breeding purposes and excellent arrowing occurred there. Plantings of breeding canes were also made in other available positions in order to ensure a good supply of arrows for cross pollination work.

A long drain was cut from the billabong along portion of the northern boundary fence and opening into one of the feeders to Mackey Creek. This was done with the object of lowering the level of water in the billabong at the end of the wet season and generally to improve the drainage of some of the lower lying fields. This depression previously had no outlet for incoming waters other than by overflow at various points around its perimeter. As a result this tract of country was continually flooded during the wet season, and the surrounding area was virtually useless; but since the construction of the drain, flood waters during the 1941 wet season were taken care of in a highly satisfactory manner and the drain appears to have served a very useful purpose.

### Introduction of New Varieties.

A few new cane varieties were planted on the station, some of which were imported for breeding purposes and had been introduced through the quarantine house in Brisbane. In addition, six varieties of *Saccharum robustum* were received from the C.S.R. Co.

The following is a list of the varieties planted during the year and which had not previously been planted on the station:—Glagah, Hind's Special, Uba Marot, Co.364, P.O.J.100, P.O.J.2727, P.O.J.2747, P.O.J.2940, 28 N.G.82, 28 N.G.201, 28 N.G.218, 28 N.G.251, 28 N.G.253, and 28 N.G.289.

### Legumes.

A number of legumes which gave promise in earlier plantings were planted again for further observation, together with some species which were new to us, and which were received through the courtesy of the Council for Scientific and Industrial Research and other organisations. The following species were among those of which plantings were made:—*Crotalaria usaramoensis, anagyroides, Leucaena glauca, Stizolobium pachylobium, derringianum, atterinum, Indigofera endecaphylla, Dolichos biflorus, Pueraria javanica, Phaseolus trinervis, lathyroides, lunatum, riccardianus* (C.P.I. 2778 and 2779), Dun pea, Partridge pea, and New Zealand Blue Lupin.

*Crotalaria usaramoensis.*—This species, which was commented on favourably in last year's report, has maintained its excellent record and is by far the most promising of our recent introductions to fit in with the requirements of sugar-cane agriculture in North Queensland. In a field scale planting of one-third of an acre, it produced a magnificent cover crop and a weighed sample gave 24 tons of green matter per acre. The stalks are very brittle and it is anticipated that no difficulty will be experienced in ploughing in the crop.

Although the seed possesses the same disability as that of Gambia pea., viz., indifferent striking except under wet conditions, the fact that *C. usaramoensis* seeds later than Gambia pea and continues to grow after seeding, gives it great possibilities as a long fallow crop. The area at Meringa was planted at the end of November, and in an adjoining strip Gambia pea was planted at the same time; whereas the Gambia pea seeded in mid-May and stopped growing at a height of 4 feet 6 inches, *C. usaramoensis* did not commence to flower until the end of June and was still growing then at a height of nearly 8 feet. *Crotalaria anagyroides* appears to germinate more readily than the other species of *Crotalaria,* but its coverage does not compare with that of *C. usaramoensis,* while its stems are far more woody than those of the latter species.

*Phaseolus riccardianus* shows promise and appears to grow particularly well on poor wet land where many standard legumes now fail badly. This species will be used in further trials; it has a longer growing period than Poona pea and does not appear to be affected by wilt in the same manner in wet country. One disadvantage is its rather poorer cover when it commences to flower and seed, and this, of course, allows the growth of winter weed unless the crop be turned under before seeding commences.

*Phaseolus trinervis* is similar, but this as well as *P. riccardianus* (2779) is not considered as good as *P. riccardianus* (2778) on account of the more prolific seeding and reduced coverage of the former varieties.

*Phaseolus lathyroides.*—This species grows commonly along headlands and roadsides in the North. It appears adapted to a variety of soil conditions, but its rather sparse foliage renders it unsuitable for a green manure crop in this district, where good cover is essential in order to control weed growth. It is reported that this species has done well in the South when mixed with grasses as a pasture crop, and it is intended to try it as such in this area.

*Pueraria javanica* grows very slowly in its early stages but vines well after some months' growth. The slow early growth, combined with its poor germination, is a disadvantage under northern conditions, as there is a tendency for the plant to become smothered by grasses before it becomes established.

*Dolichos biflorus* gave rather a poor growth in our trials here, both alone and with a sorghum nurse crop. However, in view of its performance elsewhere, it will be accorded a further trial.

*Field Peas.*—Two varieties of field pea, viz., dun pea and grey or partridge pea, were planted in order to investigate their possibilities as a winter cover crop. From their slow early progress in spite of abundant soil moisture, it would appear that these varieties require showery conditions to make good growth in the North.

### Laboratory Work.

Due to enlistment of one member of the staff, full analyses of soils were not carried out at Meringa during the year, and all such samples received were forwarded to Brisbane. Samples for lime requirements only were tested here. The usual routine work consisting of the analyses of cane samples from farm trials, farmers' samples, and maturity tests on seedlings and other new varieties was carried out and the following summary shows the number analysed during the year:—

| | Samples. |
|---|---|
| Canes (Maturity Tests) | 109 |
| Canes (Station Samples other than Maturity Tests) | 193 |
| Canes (Farm Trials) | 116 |
| Canes (Farmers' Samples) | 11 |
| Soils (Lime Tests) | 23 |
| Total | 452 |

### Field Day.

The third annual field day was held at Meringa on 19th April, 1941, in conjunction with the agricultural session of the Queensland Society of Sugar Cane Technologists.

The Honourable the Minister for Agriculture and Stock welcomed the visitors and the function was very well attended. An interesting address by the Minister opened the Sugar Cane Technologists' Session. A light luncheon was provided at the Experiment Station for those visitors who wished to remain for the afternoon's proceedings, and after lunch the Director gave an informative lantern lecture on "Soil Erosion." This was followed by an inspection of the station equipment, the seedlings, new varieties, and other items of interest to farmers.

*Crop Summary.*

| | Tons. |
|---|---|
| Cane sent to mill | 467 |
| Cane used for plants, samples, etc. | 19 |
| Total | 486 |

| | |
|---|---|
| Total area harvested | 16·3 acres |
| Tons cane per acre harvested | 29·9 tons |

| Class of Cane— | Per cent. |
|---|---|
| Plant cane | 52 |
| Ratoon cane | 48 |

| Varieties— | Per cent. |
|---|---|
| S.J.4 | 17·9 |
| Q.10 | 15·7 |
| Badila | 11·6 |
| Miscellaneous (including seedlings) | 54·8 |

## CENTRAL SUGAR EXPERIMENT STATION, MACKAY.

### METEOROLOGICAL.

The crop year 1940-41 commenced well with a phenomenal rainfall (676 points) in August, but this was unfortunately followed by very light falls until the end of the year, thus spoiling very good prospects of the majority of spring planted canefields. Rain during January-March was fairly normal, but the continuation of the wet season throughout April, when about four times the average rain fell (2,138 points as against 559 points) had a very drastic effect upon yield expectations, while showery conditions of May added further thereto.

The total fall for the year was 7,371 points, against the average of 6,379 points.

Crops throughout the central district will, as a result of wetness and consequent lack of early cultivation, be light and below the yields of recent years.

Observations on the station showed that the water-table again rose to the soil surface, and remained there for practically three days during the second week of April. From experience since 1936 it is now expected that the crop will be drought-susceptible, will ripen early and abnormally, and will not reach a high average C.C.S.

The prolonged wet season, combined with showery weather in May and June, resulted in much loss of ploughing time, and this year's planting operations have thus been delayed to a very considerable extent.

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE SUGAR EXPERIMENT STATION AT MACKAY, FROM 1ST JULY, 1940, TO 30TH JUNE, 1941.

| Month. | Inches Rainfall. | Wet Days. | Average Rainfall. | Shade Temperatures. Maximum. High. | Maximum. Low. | Maximum. Mean. | Minimum. High. | Minimum. Low. | Minimum. Mean. |
|---|---|---|---|---|---|---|---|---|---|
| 1940. | | | | | | | | | |
| July | 0·11 | 2 | 1·40 (*a*) | 77·5 | 69·5 | 74·1 | 60·5 | 36·0 | 46·9 |
| August | 6·76 | 8 | 1·06 (*a*) | 82·0 | 66·0 | 74·2 | 63·5 | 41·0 | 53·1 |
| September | 0·08 | 5 | 1·62 (*a*) | 89·5 | 74·5 | 79·1 | 64·0 | 48·5 | 54·8 |
| October | 0·16 | 5 | 1·66 (*a*) | 89·5 | 75·0 | 81·8 | 71·5 | 48·0 | 58·0 |
| November | 0·91 | 6 | 3·02 (*a*) | 95·0 | 84·5 | 87·8 | 76·0 | 57·0 | 66·6 |
| December | 1·06 | 15 | 7·09 (*a*) | 100·5 | 85·0 | 88·9 | 77·5 | 62·5 | 69·2 |
| 1941. | | | | | | | | | |
| January | 18·87 | 21 | 13·93 (*b*) | 93·0 | 78·0 | 85·6 | 74·5 | 66·0 | 71·4 |
| February | 6·87 | 18 | 11·82 (*b*) | 91·5 | 79·5 | 81·0 | 74·0 | 65·0 | 67·0 |
| March | 9·13 | 20 | 10·63 (*b*) | 92·0 | 73·0 | 85·0 | 74·0 | 62·5 | 70·3 |
| April | 21·38 | 26 | 5·59 (*b*) | 84·0 | 75·0 | 79·8 | 72·5 | 54·5 | 65·8 |
| May | 4·31 | 15 | 3·35 (*b*) | 80·0 | 67·0 | 76·5 | 66·5 | 49·5 | 60·1 |
| June | 4·07 | 8 | 2·62 (*b*) | 79·5 | 65·5 | 75·1 | 64·5 | 39·0 | 50·5 |
| Totals | 73·71 | 149 | .. | .. | .. | .. | .. | .. | .. |

N.B.—Rainfalls—(*a*) = average 40 years, (*b*) = average 41 years.

ANNUAL RAINFALL SINCE 1920 AT SUGAR EXPERIMENT STATION, MACKAY.

| Year. | Rainfall in Inches. | Year. | Rainfall in Inches. |
|---|---|---|---|
| 1920 | 57·27 | 1932 | 48·48 |
| 1921 | 95·89 | 1933 | 71·94 |
| 1922 | 34·47 | 1934 | 37·57 |
| 1923 | 25·23 | 1935 | 45·15 |
| 1924 | 53·37 | 1936 | 97·37 |
| 1925 | 54·80 | 1937 | 56·60 |
| 1926 | 34·69 | 1938 | 52·18 |
| 1927 | 83·87 | 1939 | 56·14 |
| 1928 | 72·28 | 1940 | 84·97 |
| 1929 | 64·03 | 1941 (6 months) | 64.63 |
| 1930 | 55·81 | Average, 21 years | 57·72 |
| 1931 | 30·01 | | |

### VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

| | | | | |
|---|---|---|---|---|
| G.22 | G.39 | G.17 | Q.813 | G.58 |
| 25.0 | 20.6 | 23.2 | 15.2 | 11.4 |
| G.58 | G.17 | Q.813 | G.22 | G.39 |
| 12.4 | 23.6 | 15.4 | 23.8 | 17.0 |
| Q.813 | G.22 | G.58 | G.39 | G.17 |
| 18.0 | 22.8 | 14.6 | 16.8 | 20.4 |
| G.39 | G.58 | G.22 | G.17 | Q.813 |
| 15.8 | 16.8 | 20.8 | 22.4 | 14.6 |
| G.17 | Q.813 | G.39 | G.58 | G.22 |
| 19.4 | 15.2 | 18.0 | 18.8 | 20.8 |

*Block.*—A4.
*Harvested.*—October, 1940.
*Age of Crop.*—13½ months.
*Experimental Plan.*—5 × 5 Latin Square.
*Plots.*—1/16 acre.

### GROWTH NOTES.

The canes in the plots struck well, but the progress of the young cane was greatly handicapped by wet weather, which prevented adequate cultivation.

CROP YIELDS.

| Variety. | Cane per Acre. | C.C.S. in Cane. |
|---|---|---|
| | Tons. | Per cent. |
| G.17 | 21·8 | 16·9 |
| G.22 | 22·4 | 15·9 |
| G.39 | 17·8 | 17·8 |
| G.58 | 14·8 | 17·1 |
| Q.813 | 15·7 | 17·4 |

### DISCUSSION.

The variety G.17 was subsequently condemned because of downy mildew susceptibility, while G.39 and G.58 show unfavourable growth habits. G.22, though sub-normal in sugar content on the results of this trial, is the only variety selected for further propagation.

### VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

| | | | | |
|---|---|---|---|---|
| E.45 | Q.813 | Comus | Q.28 | E.4 |
| 19.4 | 12.9 | 26.8 | 32.6 | 25.7 |
| E.4 | Q.28 | E.45 | Q.813 | Comus |
| 22.5 | 27.7 | 24.0 | 22.1 | 30.4 |
| Q.813 | Comus | Q.28 | E.4 | E.45 |
| 17.4 | 21.3 | 31.0 | 26.3 | 19.1 |
| Comus | E.4 | Q.813 | E.45 | Q.28 |
| 27.0 | 24.1 | 18.0 | 19.1 | 29.5 |
| Q.28 | E.45 | E.4 | Comus | Q.813 |
| 31.7 | 21.6 | 25.8 | 27.2 | 17.6 |

*Block.*—B2.
*Harvested.*—October, 1940.
*Age of Crop.*—12 months.
*Experimental Plan.*—5 × 5 Latin Square.
*Plots.*—1/18 acre.

SUMMARY OF CROP YIELDS—PLANT AND FIRST RATOON CROPS.

| Variety. | Plant Crop. | | First Ratoon Crop. | |
|---|---|---|---|---|
| | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. |
| | Tons. | Per cent. | Tons. | Per cent. |
| E.4 .. .. .. | 36·7 | 15·7 | 24·9 | 17·4 |
| E.45 .. .. | 28·8 | **16·3** | 20·6 | **17·9** |
| Q.28 .. .. | **41·4** | 14·3 | 30·5 | 16·2 |
| Comus .. .. | 36·0 | 16·2 | 26·5 | 17·0 |
| Q.813 .. .. | 30·1 | 16·2 | 17·6 | 17·1 |

## DISCUSSION.

Of these varieties, Q.28 has shown exceptional yielding qualities, though the C.C.S. is subnormal. Comus, a seedling bred by the C.S.R. Company, has also shown promising all-round qualities. Both varieties will be planted in farm propagation plots, in all Mackay mill areas, during the spring of 1941.

## OBSERVATIONAL VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

| | | | | | | |
|---|---|---|---|---|---|---|
| H.41 | Q.813 | H.43 | G.53 | Q.813 | H.63 | H.45 |
| 13.8 | 12.3 | 15.8 | 13.3 | 11.0 | 18.3 | 20.8 |
| G.47 | Q.2 | H.23 | G.49 | G.43 | H.59 | Q.813 |
| 9.0 | 8.0 | 4.0 | 13.8 | 15.8 | 12.0 | 16.3 |
| Q.813 | G.44 | H.33 | Q.813 | H.18 | G.48 | H.61 |
| 8.8 | 7.0 | 4.5 | 12.0 | 10.0 | 13.8 | 15.0 |

*Block.*—A4.
*Age of Crop.*—13½ months.
*Harvested.*—November, 1940.
*Plots.*—1/20 acre.

SUMMARY OF YIELDS, PLANT CROP.

| Variety. | Cane per Acre. | C.C.S. in Cane. |
|---|---|---|
| | Tons. | Per cent. |
| G.43 .. .. .. .. .. | 15·8 | .. |
| G.44 .. .. .. .. .. | 7·0 | .. |
| G.47 .. .. .. .. .. | 9·0 | .. |
| G.48 .. .. .. .. .. | 13·8 | 16·6 |
| G.49 .. .. .. .. .. | 13·8 | .. |
| G.53 .. .. .. .. .. | 13·3 | .. |
| H.18 .. .. .. .. .. | 10·0 | 18·5 |
| H.23 .. .. .. .. .. | 4·0 | .. |
| H.33 .. .. .. .. .. | 4·5 | .. |
| H.41 .. .. .. .. .. | 13·8 | .. |
| H.43 .. .. .. .. .. | 15·8 | 15·6 |
| H.45 .. .. .. .. .. | 20·8 | 17·0 |
| H.59 .. .. .. .. .. | 12·0 | 15·5 |
| H.61 .. .. .. .. .. | 15·0 | .. |
| H.63 .. .. .. .. .. | 18·3 | 15·4 |
| Q.2 .. .. .. .. .. | 8·0 | .. |
| Q.813 (Average of 5 plots) .. .. | 12·1 | 16·9 |

## DISCUSSION.

Under the conditions experienced the canes as a whole grew poorly, and many of the plots were virtual failures. Varieties H.43, H.45, H.63, and G.48 were selected for further tests, and were planted as a Latin Square trial on Block A5.

## OBSERVATIONAL VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

| | | | |
|---|---|---|---|
| F.57 | F.21 | Q.813 | G.22 |
| 30.8 | 27.7 | 29.0 | 38.0 |
| G.39 | Q.813 | G.18 | G.19 |
| 29.0 | 22.3 | 34.8 | 34.3 |
| F.40 | G.5 | G.52 | Q.813 |
| 23.8 | 28.3 | 24.0 | 19.8 |
| Q.813 | G.58 | F.58 | G.17 |
| 19.8 | 21.5 | 27.5 | 36.8 |
| G.20 | G.8 | Q.813 | F.31 |
| 32.8 | 33.5 | 20.8 | 22.3 |

*Block.*—B2.
*Harvested.*—September, 1940.
*Age of Crop.*—13½ months.
*Plots.*—1/20 acre.

SUMMARY OF CROP YIELDS—PLANT AND FIRST RATOON CROPS.

| Variety. | Plant Crop. | | First Ratoon Crop. | |
|---|---|---|---|---|
| | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. |
| | Tons. | Per cent. | Tons. | Per cent. |
| G.5 .. .. .. | 38·3 | .. | 28·5 | .. |
| G.8 .. .. .. | 40·5 | .. | 33·5 | .. |
| G.17 .. .. | 48·3 | 13·9 | 36·8 | 16·9 |
| G.18 .. .. | 47·0 | .. | 34·8 | .. |
| G.19 .. .. | 39·8 | .. | 34·3 | .. |
| G.20 .. .. | 44·0 | .. | 32·8 | .. |
| G.22 .. .. | 42·5 | 13·8 | 38·0 | 15·9 |
| G.39 .. .. | 39·8 | 15·9 | 29·0 | 17·8 |
| G.58 .. .. | 49·8 | 17·2 | 21·5 | 17·1 |
| F.21 .. .. | 33·8 | .. | 27·7 | .. |
| F.31 .. .. | 33·8 | .. | 22·3 | .. |
| F.40 .. .. | 35·3 | .. | 23·8 | .. |
| F.57 .. .. | 36·0 | .. | 30·8 | .. |
| F.58 .. .. | 34·5 | .. | 27·5 | .. |
| Q.813 (Average) .. | 33·8 | 15·4 | 22·3 | 17·4 |

## DISCUSSION.

Of these varieties, only G.17, G22, G. 39, and G.58 survived the present test. The results from these selected varieties in a further field trial are recorded on p. 9, from which it is noted that G.22 only has been retained for further propagation.

## VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

| | | | | |
|---|---|---|---|---|
| Q.28 | Jason | Q.20 | Comus | Q.813 |
| 16.8 | 15.6 | 9.0 | 24.1 | 18.5 |
| Q.813 | Q.20 | Q.28 | Jason | Comus |
| 9.3 | 6.3 | 16.1 | 13.9 | 20.4 |
| Comus | Q.813 | Jason | Q.28 | Q.20 |
| 24.4 | 13.5 | 16.1 | 19.9 | 10.9 |
| Jason | Comus | Q.813 | Q.20 | Q.28 |
| 19.4 | 25.8 | 18.3 | 13.4 | 20.5 |
| Q.20 | Q.28 | Comus | Q.813 | Jason |
| 16.3 | 21.8 | 24.2 | 19.3 | 18.3 |

*Block.*—B4.

*Harvested.*—September, 1940.

*Age of Crop.*—12 months.

*Experimental Plan.*—5 × 5 Latin Square.

*Plots.*—1/10 acre.

## GROWTH NOTES.

Late planting, combined with dry conditions, caused poor and irregular germination. Subsequently, excessive wetness prevented adequate cultivation of the young cane, and weed growth severely checked the cane.

CROP YIELDS.

| Variety. | Cane per acre. | C.C.S. in Cane. |
|---|---|---|
| | Tons. | Per cent. |
| Q.20 .. .. .. .. .. | 11·2 | 18·4 |
| Q.28 .. .. .. .. .. | 19·0 | 16·9 |
| Comus .. .. .. .. .. | **23·7** | 17·0 |
| Jason .. .. .. .. .. | 16·7 | 15·4 |
| Q.813 .. .. .. .. .. | 15·8 | 17·5 |

## DISCUSSION.

The plots were harvested irregularly, as some of the cane was taken as required for the planting of farm trials. The yield values must therefore be taken as approximate. It is evident that Comus and Q.28 are canes worthy of further trial, and they will be planted on a wide selection of soil types during 1941.

FERTILITY TRIAL (Plant Crop).

PLAN AND YIELDS.

| | | |
|---|---|---|
| 1N<br>0P<br>1K<br>28.5 | 2N<br>0P<br>2K<br>28.5 | 0N<br>2P<br>1K<br>28.3 |
| 2N<br>2P<br>0K<br>30.2 | 0N<br>1P<br>2K<br>29.2 | 1N<br>1P<br>0K<br>31.9 |
| 1N<br>2P<br>2K<br>27.0 | 2N<br>1P<br>1K<br>31.3 | 0N<br>0P<br>0K<br>26.6 |
| 0N<br>0P<br>2K<br>32.9 | 1N<br>1P<br>2K<br>31.0 | 2N<br>0P<br>1K<br>32.1 |
| 2N<br>2P<br>2K<br>33.6 | 1N<br>0P<br>0K<br>33.1 | 0N<br>2P<br>0K<br>29.2 |
| 0N<br>1P<br>1K<br>31.5 | 1N<br>2P<br>1K<br>32.3 | 2N<br>1P<br>0K<br>32.3 |
| 2N<br>2P<br>1K<br>33.8 | 0N<br>1P<br>0K<br>30.0 | 0N<br>0P<br>1K<br>28.7 |
| 1N<br>0P<br>2K<br>31.0 | 1N<br>1P<br>1K<br>30.9 | 0N<br>2P<br>2K<br>34.2 |
| 2N<br>1P<br>2K<br>30.9 | 2N<br>0P<br>0K<br>32.9 | 1N<br>2P<br>0K<br>31.7 |

*Block.*—B3.
*Harvested.*—September, 1940.
*Age of Crop.*—13 months.
*Experimental Plan.*—Factorial 3 × 3 × 3.
*Plots.*—0.06 acre.

*Fertilizer Treatments.*—
1N = 200 lb. A.S. per acre.
2N = 400 lb. A.S. per acre.
1P = 200 lb. superphosphate per acre.
2P = 400 lb. superphosphate per acre.
1K = 125 lb. muriate of potash per acre.
2K = 250 lb. muriate of potash per acre.

CROP YIELDS.

| Treatment. | Cane per Acre. | C.C.S. in Cane. |
|---|---|---|
| | Tons. | Per cent. |
| 0N | 30·2 | 15·4 |
| 1N | 30·8 | 14·7 |
| 2N | 31·7 | 16·0 |
| 0P | 30·5 | 15·8 |
| 1P | 31·0 | 15·1 |
| 2P | 31·1 | 16·0 |
| 0K | 30·9 | 15·6 |
| 1K | 30·8 | 16·0 |
| 2K | 30·9 | 15·2 |

## DISCUSSION.

The variety was Q.28, and it will be noted that no substantial gains were recorded for any of the treatments employed. The land had been fallowed under green manure crop prior to planting. The most interesting observation made on this trial was the pronounced influence of nitrogen on the arrowing of the crop. Counts showed—

| Treatment. | Percentage Arrowed Stalks. |
|---|---|
| No nitrogen | 71 |
| 200-lb. sulphate ammonia | 54 |
| 400-lb. sulphate ammonia | 11 |

These figures suggest that sulphate of ammonia might be employed to control arrowing, at least to some extent, under favourable conditions.

## Rotational Experimental Block, Division C.

*Section* 1.—This section is now under pasture and is being grazed by the sheep.

*Section* 2 was seeded with Rhodes grass, and Para grass runners were also planted during the spring. It was brought into the grazing area in February, 1941.

*Section* 3.—The first ratoon Q.20 crop was harvested in the leaf, yielding 26·8 tons per acre at 16·3 C.C.S. when cut in July, 1940. The trash was turned under, and Gambia pea sown in December. The germination was fair, and a heavy crop of mixed vegetation was turned under in March, 1941. Rhodes seed and Para grass runners were subsequently sown, but have not yet become sufficiently established to permit grazing.

*Section* 4.—The plant crop of Q.20 was harvested. It yielded only 9·3 tons per acre, the poor crop being due to poor germination combined with uncontrollable weed growth during the wet season. The trash was saved and the ratoons refertilized at the rate of 4 cwt. ratooning mixture and 3 cwt. sulphate of ammonia per acre.

*Section* 5 was prepared for planting, but this was delayed, due to the existence of wireworms. E.K.28 was used, in October, but the dry conditions resulted in a poor stand, which did not make progress against weeds and waterlogging during the wet season.

*Section* 6.—In July, 1940, this block was limed at the rate of 2 tons agricultural lime per acre. It was broken up in November, and well worked to eradicate Para grass. Poona pea was sown in December, and this produced a good crop which, however, had matured before ploughing under was possible, in March, 1941. The surface drainage of the block has since been improved, and it will be planted when safety from wireworm damage is assured, in the spring of 1941.

*Sections* 7, 8, 1, and 2, which are now to be grazed, produced an abundance of green feed throughout the year, and supplementary feeding of the stock was not necessary.

The sheep were shorn in October, 1940, yielding an average of 5¼-lb. wool per head.

The season was notable for the heavy and serious worm infestation of all trial flocks in the district. The animals on the station were drenched at frequent intervals, and no losses were recorded. Other farmers lost many or all of their young stock before the wet season terminated. Two old ewes died during the year, and two lambs were killed, apparently by snake bite: snakes are numerous in this block. A further Romney Marsh ram was procured during the year.

### EXPERIMENTAL LEGUMES.

Two species of Crotalaria, which had performed well during the previous year, were tested once more. Though they did not germinate until January, good crops resulted, and *C. usaramoensis* was particularly promising.

The Phaseolus and Dolichos species failed in competition with grasses and weeds, and seem unsuitable for the particular conditions.

A new legume, *Phaseolus lunatum*, was introduced from the Giru district. This has been cultivated at that centre since 1917, where it was known as Pink Mauritius bean. In a small scale trial it performed very well, and its drought resistance would appear to commend it. It also exhibited the ability to grow over a prolonged period, and set seed only after the winter. It will be further tested this year, as a mixture with Poona pea.

### HORSES.

The station animals have again maintained their condition on the ration of chop chop, molasses, and protein meal. With the purchase of a tractor for farm work, some of the animals will be available for disposal.

### LABORATORY WORK.

The following cane analyses were made during the year:—

| | |
|---|---|
| Station samples | 285 |
| Farmers' samples | 96 |
| Mackay show exhibits | 60 |
| Farm Trial samples | 90 |
| | 531 |

SUMMARY OF CANE YIELDS, 1940.

| Block. | Variety. | Total Tonnage Harvested. | Tons Cane per Acre. |
|---|---|---|---|
| A.1 | Seedlings | 40·6 | 18·5 |
| A.2 | Seedlings | 60·9 | 25·4 |
| A.4 | Various | 51·1 | 16·5 |
| B.2 | Various | 63·3 | 24·3 |
| B.3 | Q.28 | 56·3 | 29·6 |
| B.4 | Various | 39·8 | 13·9 |
| C.3 | Q.20 | 48·2 | 26·8 |
| C.4 | Q.20 | 17·7 | 9·3 |
| D.1 | M.1900/P.O.J. 2725 | 83·4 | 16·4 |
| D.2 | M.1900/Q.20 | 118·1 | 16·0 |
| | Total and Average = | 579·4 | 18·5 |

## SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG.

Mr. N. J. King, Chemist in Charge.

### METEOROLOGICAL.

Very poor winter rains in 1940 followed by an extremely dry spring considerably delayed the ratoon cane and almost prevented the planting of any crops during the spring months. The end of a seven months drought came in November when the total rainfall amounted to some two and a-half inches. This was followed by fair December rains, and the ratoon crop then really began to grow. From the beginning of the year to the middle of April excellent growing weather prevailed; fertilized crops were able to make very rapid headway, and thus ensure the crop for the following season. Further good rains fell in late May and early June, and these unexpected falls provided soil moisture for the winter months and conferred the extra benefit of some freedom from frost damage.

#### 1940 Crop.

The 1940 crops in the Bundaberg district were an all-time record, and were far in excess of the peak requirements of the various mills. The large available export quota was responsible, of course, for the record crushings, but even so, a reasonable amount of cane was left standover for the 1941 season. Once again the value of the standover practise makes itself evident in this area. The 1939-1940 rainfall was one which left much to be desired in point of view of distribution, and was not nearly so good as were previous years. In spite of this, however, the large proportion of P.O.J.2878 now being grown as a two-year-old crop results in an excellent average yield being obtained from year to year almost irrespective of weather conditions in any given period. The replacement of the proportionate harvesting system with farm peaks will now introduce a different type of control on production, and it remains to be seen in future years whether the changeover will result in increased production per acre on less area or in reduced tonnage per acre on the same area as now.

| Month. | Rainfall. | No. Wet Days. | Highest Shade Max. | Lowest Shade Max. | Mean Shade Max. | Highest Shade Min. | Lowest Shade Min. | Mean Shade Min. | Mean Diurnal Range. | Mean Temperature 8 a.m. | Mean Relative Humidity 8 a.m. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1940. | | | | | | | | | | | |
| July .. .. .. | 0·52 | 3 | 77 | 65 | 72·4 | 60 | 32 | 44·7 | 27·7 | 54·4 | 85·7 |
| August .. .. .. | 1·02 | 5 | 80 | 66 | 74·5 | 60 | 40 | 50·3 | 24·2 | 59·4 | 81·0 |
| September .. .. | 0·64 | 4 | 83 | 72 | 77·8 | 58 | 45 | 52·1 | 25·7 | 65·6 | 80·1 |
| October .. .. .. | 0·55 | 2 | 91 | 72 | 80·4 | 70 | 48 | 59·4 | 21·0 | 72·2 | 70·1 |
| November .. .. | 2·42 | 6 | 90 | 79 | 85·0 | 75 | 50 | 66·1 | 18·9 | 77·6 | 70·8 |
| December .. .. .. | 5·69 | 11 | 91 | 81 | 84·3 | 73 | 63 | 68·3 | 16·0 | 77·7 | 70·8 |
| 1941. | | | | | | | | | | | |
| January .. .. .. | 9·99 | 13 | 89 | 75 | 83·2 | 74 | 65 | 69·7 | 13·5 | 77·4 | 80·0 |
| February .. .. .. | 3·05 | 13 | 88 | 79 | 83·8 | 75 | 63 | 67·8 | 16·0 | 77·2 | 83·1 |
| March .. .. .. | 8·60 | 7 | 89 | 77 | 84·5 | 74 | 51 | 70·0 | 14·5 | 75·5 | 79·1 |
| April .. .. .. | 2·64 | 12 | 84 | 73 | 79·1 | 68 | 45 | 61·2 | 17·9 | 70·0 | 85·0 |
| May .. .. .. | 5·37 | 8 | 80 | 66 | 74·8 | 64 | 49 | 58·3 | 16·5 | 63·1 | 81·9 |
| June .. .. .. | 2·77 | 5 | 75 | 64 | 70·2 | 62 | 36 | 51·2 | 19·0 | 56·6 | 81·7 |

#### Rainfall Records.

The following are the rainfall records taken at this station since the Experiment Station began operations in 1914. To conform with the year covered by the report the rainfalls are given for the growing season beginning in July and ending in June:—

| | | | |
|---|---|---|---|
| 1914–1915 .. .. | 31·99 | 1928–1929 .. .. | 31·16 |
| 1915–1916 .. .. | 28·54 | 1929–1930 .. .. | 43·16 |
| 1916–1917 .. .. | 58·08 | 1930–1931 .. .. | 47·19 |
| 1917–1918 .. .. | 49·85 | 1931–1932 .. .. | 22·88 |
| 1918–1919 .. .. | 24·24 | 1932–1933 .. .. | 36·81 |
| 1919–1920 .. .. | 28·20 | 1933–1934 .. .. | 71·45 |
| 1920–1921 .. .. | 45·16 | 1934–1935 .. .. | 40·01 |
| 1921–1922 .. .. | 44·97 | 1935–1936 .. .. | 44·24 |
| 1922–1923 .. .. | 37·14 | 1936–1937 .. .. | 31·65 |
| 1923–1924 .. .. | 34·16 | 1937–1938 .. .. | 44·40 |
| 1924–1925 .. .. | 50·96 | 1938–1939 .. .. | 41·01 |
| 1925–1926 .. .. | 37·62 | 1939–1940 .. .. | 41·69 |
| 1926–1927 .. .. | 68·18 | 1940–1941 .. .. | 43·26 |
| 1927–1928 .. .. | 74·69 | | |

### VARIETAL TRIAL (Plant Crop).

#### Plan and Yields.

| | | | | |
|---|---|---|---|---|
| Co.290 | E.12 | C.P. 29/116 | F.20 | Q.20 |
| 27.0 | 28.1 | 41.3 | 27.6 | 18.6 |
| E.12 | F.20 | Q.20 | C.P.29/116 | Co.290 |
| 28.7 | 28.9 | 18.1 | 40.5 | 27.6 |
| C.P.29/116 | Q.20 | Co.290 | E.12 | F.20 |
| 38.6 | 17.6 | 27.4 | 25.8 | 31.2 |
| Q.20 | C.P.29/116 | F.20 | Co.290 | E.12 |
| 19.2 | 37.6 | 29.2 | 28.4 | 29.4 |
| F.20 | Co.290 | E.12 | Q.20 | C.P.29/116 |
| 30.0 | 32.6 | 32.4 | 18.6 | 41.5 |

*Block.*—A.1.
*Harvested.*—October, 1940.
*Age of Crop.*—13 months.
*Experimental Plan.*—5 × 5 Latin Square.
*Area of Plot.*—0·0476 acre.
*Varieties.*—Seedlings *v.* Co.290. (Guard rows of P.O.J.234 were planted between columns of plots.)

#### TREATMENTS.

After ploughing out the previous crop on this block, in spring, 1938, the field was planted with Poona pea and the resultant poor crop ploughed in. The block was then left in bare fallow until August when the above trial was planted. Plants of Q.20 came from Ayr, and the remaining four varieties from the Experiment Station. The Q.20 gave a very poor germination and was supplied in October, but the resultant stand was only about 50 per cent. C.P.29/116 gave the best stand, the others being also unsatisfactory strikes. This was mainly due to the very late winter experienced in Bundaberg in 1939, and also the dry conditions. The block was sprayed to induce good germination, but cool conditions were against it. Fertilizer was used uniformly on all plots at the rate of 3 cwt. of Sugar Bureau No. 3 mixture per acre at time of planting.

#### Crop Yields.

| Variety. | Cane per Acre. | C.C.S. in Cane. |
|---|---|---|
| | Tons. | Per cent. |
| E.12 (Q.42) .. .. .. .. | 28·9 | **16.6** |
| F.20 .. .. .. .. .. | 29·4 | 12·3 |
| Q.20 .. .. .. .. .. | 18·4 | 16·5 |
| C.P.29/116 .. .. .. .. | **39·9** | 14·2 |
| Co.290 .. .. .. .. .. | 28·6 | 11·3 |

#### DISCUSSION.

The variety C.P.29/116 germinated early and maintained its lead throughout the season. E.12 (Q.42) was slow to start, while Q.20 was backward all the year. F.20 and Co.290 made normal growth as compared with other years, but F.20 has been eliminated, due to downy mildew susceptibility, while the others have gone to further trials.

### VARIETAL TRIAL (First Ratoon Crop).

#### Plan and Yields.

| | | | | |
|---|---|---|---|---|
| E.18 | Comus | E.14 | C.12 | Co.290 |
| 29.2 | 25.4 | 41.5 | 29.7 | 31.0 |
| E.14 | Co.290 | C.12 | E.18 | Comus |
| 33.0 | 30.7 | 25.4 | 31.1 | 27.6 |
| C.12 | E.14 | Co.290 | Comus | E.18 |
| 30.1 | 35.2 | 33.6 | 25.4 | 31.1 |
| Comus | C.12 | E.18 | Co.290 | E.14 |
| 25.0 | 21.7 | 28.2 | 30.7 | 34.6 |
| Co.290 | E.18 | Comus | E.14 | C.12 |
| 32.8 | 28.2 | 26.8 | 30.0 | 32.3 |

*Block.*—A.2.
*Harvested.*—October, 1940.
*Age of Crop.*—12 months.
*Experimental Plan.*—5 × 5 Latin Square.
*Plots.*—0·0484 acre. (Guard rows of P.O.J.234 and Co.281 were planted between columns of plots).

## TREATMENTS.

Immediately after harvesting the plant cane, the crop residues were raked up and burnt. The block was then ratooned with the tractor grubber and fertilizer applied alongside every row with the distributor. Sugar Bureau No. 3 ratooning mixture was used at the rate of 3 cwt. per acre, and this was followed in November with 1½ bags of sulphate of ammonia per acre.

SUMMARY OF CROP YIELDS

| Variety. | Plant Crop. | | First Ratoon Crop. | |
|---|---|---|---|---|
| | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. |
| | Tons. | Per cent. | Tons. | Per cent. |
| Comus .. .. | 23·0 | 16·1 | 26·0 | 16·1 |
| C.12 .. .. | 27·4 | 14·9 | 27·8 | 14·9 |
| E.18 .. .. | 27·6 | 16·9 | 29·6 | 16·7 |
| E.14 (Q.43) .. | 28·3 | **17·2** | **34·9** | **16·9** |
| Co.290 .. .. | **29·1** | 15·5 | 31·8 | 12·6 |

## DISCUSSION.

Starting with the October, 1939, rains the block made good headway during the summer months. A check to growth occurred in January, but good growing conditions in the following three months made the crop a reasonable one for 1940. The variety E.14 (Q.43) has been selected for further plantings, but the others have now been eliminated for various reasons. The high sugar content of Q.43, combined with its good yield and downy mildew resistance, justify its planting out in farm trials.

## OBSERVATIONAL VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

| | | |
|---|---|---|
| F.22<br>34.8 | Co.290<br>38.6 | F.21<br>34.4 |
| F.25<br>27.4 | F.23<br>23.2 | F.10<br>32.2 |
| Co.290<br>35.8 | F.19<br>27.4 | Co.290<br>38.4 |
| F.20<br>31.2 | F.28<br>15.6 | F.26<br>27.6 |

*Block.*—A.3.
*Harvested.*—August, 1940.
*Age of Crop.*—12 months.
*Plots.*—0·0783 acre.

## TREATMENTS.

After harvesting the plant cane, the crop residues were burnt off. The block was ratooned with the tractor grubber and fertilizer applied evenly to all plots at the rate of 3 cwt. per acre. Sugar Bureau No. 3 ratooning mixture was used. Two months after ratooning a top dressing of sulphate of ammonia was applied at the rate of 1½ bags per acre.

## GROWTH NOTES.

Ratoons were rather slow in coming away owing to the late winter and dry spring. The variety F.28 failed badly in ratooning, and the stand was only about 50 per cent. Other varieties ratooned well. Growth was satisfactory from October to April with the exception of the month of January when rainfall was well below normal.

SUMMARY OF CROP YIELDS.

| Variety. | Plant Crop. | | First Ratoon Crop. | |
|---|---|---|---|---|
| | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. |
| | Tons. | Per cent. | Tons. | Per cent. |
| F.28 .. .. | 21·2 | **13·4** | 15·6 | **16·2** |
| F. 25 .. .. | 23·6 | 12·0 | 27·4 | 14·1 |
| F.26 .. .. | 24·5 | 10·4 | 27·6 | 13·5 |
| F.10 .. .. | 24·5 | 13·7 | 32·2 | 12·9 |
| Co.290 (3 plots) .. | 25·6 | 11·5 | **37·6** | 12·5 |
| F.19 .. .. | 25·8 | 11·8 | 27·4 | 14·1 |
| F.22 .. .. | 25·9 | 11·7 | 34·8 | 14·2 |
| F.23 .. .. | 26·0 | 12·3 | 23·2 | 15·7 |
| F.21 .. .. | 26·2 | 12·8 | 34·4 | 13·1 |
| F.20 .. .. | **28·1** | 11·7 | 31·2 | 14·4 |

## DISCUSSION.

Variety F.20 was selected for inclusion in further field trials, and the yields of this cane in comparison with other new varieties will be found on p. 12.

## FACTORIAL FERTILITY TRIAL (Second Ratoon Crop).

PLAN AND YIELDS.

| | | |
|---|---|---|
| 1N<br>1P<br>0K<br>30.4 | 2N<br>1P<br>1K<br>34.4 | 0N<br>2P<br>0K<br>30.8 |
| 2N<br>2P<br>2K<br>32.6 | 0N<br>0P<br>1K<br>23.2 | 1N<br>0P<br>2K<br>30.2 |
| 0N<br>1P<br>2K<br>27.8 | 1N<br>2P<br>1K<br>29.5 | 2N<br>0P<br>0K<br>27.6 |
| 2N<br>0P<br>1K<br>29.7 | 0N<br>1P<br>0K<br>17.5 | 1N<br>2P<br>2K<br>26.0 |
| 0N<br>0P<br>2K<br>23.5 | 1N<br>0P<br>0K<br>24.3 | 2N<br>2P<br>0K<br>24.3 |
| 1N<br>1P<br>1K<br>29.3 | 2N<br>1P<br>2K<br>30.2 | 0N<br>2P<br>1K<br>23.9 |
| 0N<br>1P<br>1K<br>23.5 | 1N<br>2P<br>0K<br>27.8 | 2N<br>2P<br>1K<br>33.4 |
| 2N<br>1P<br>0K<br>30.2 | 0N<br>0P<br>0K<br>18.9 | 1N<br>0P<br>1K<br>29.5 |
| 1N<br>1P<br>2K<br>32.7 | 2N<br>0P<br>2K<br>33.4 | 0N<br>2P<br>2K<br>26.5 |

*Block.*—B.1.
*Harvested.*—August, 1940.
*Age of Crop.*—10 months.
*Variety.*—Co.290.
*Plan.*—3 × 3 × 3 factorial trial.
*Plots.*—0·067 acre.

## TREATMENTS.

After harvesting the first ratoon crop in 1939 the crop residues were burnt off. The block was ratooned with the tractor grubber and fertilizer then applied by hand according to the following formula:—

1P = 400 lb. per acre superphosphate.
2P = 800 lb. per acre superphosphate.
1K = 180 lb. per acre muriate of potash.
2K = 360 lb. per acre muriate of potash.

When the ratoons were fairly well advanced a top dressing of sulphate of ammonia was applied to the "nitrogen" plots in accordance with the formula—

1N = 120 lb. per acre of ammonium sulphate.
2N = 240 lb. per acre of ammonium sulphate.

The 1N was applied in one dressing, while the 2N was divided into two separate applications.

## GROWTH NOTES.

Growth was very good in this trial, although it was slowed up somewhat by the dry January. Fertility differences were apparent quite early in the crop and nitrogen deficiency was particularly outstanding.

SUMMARY OF CROP YIELDS—PLANT, FIRST AND SECOND RATOON CROPS.

| Treatment. | Plant Crop. | | First Ratoon Crop. | | Second Ratoon Crop. | |
|---|---|---|---|---|---|---|
| | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. |
| | Tons. | Per cent. | Tons. | Per cent. | Tons. | Per cent. |
| 0N .. .. .. | 35·1 | 12·7 | 26·6 | 14·9 | 24·0 | 15·0 |
| 1N .. .. .. | 34·3 | 12·4 | 26·5 | 15·0 | 28·9 | 14·4 |
| 2N .. .. .. | 35·3 | 12·5 | 27·6 | 14·8 | 30·6 | 13·3 |
| 0P .. .. .. | 34·1 | 12·5 | 26·6 | 14·7 | 26·7 | 14·3 |
| 1P .. .. .. | 35·5 | 12·5 | 27·1 | 15·0 | 28·4 | 13·9 |
| 2P .. .. .. | 35·0 | 12·5 | 27·0 | 15·1 | 28·3 | 14·4 |
| 0K .. .. .. | 34·5 | 12·8 | 26·4 | 15·2 | 25·8 | 14·3 |
| 1K .. .. .. | 35·4 | 12·5 | 26·5 | 14·9 | 28·5 | 14·2 |
| 2K .. .. .. | 34·8 | 12·3 | 27·9 | 14·7 | 29·2 | 14·2 |

## DISCUSSION.

The results of this experiment are most interesting in demonstrating how well the Bundaberg red volcanic lands can supply available plantfoods to heavy cane crops, before notable deficiencies arise. In this trial, no benefits from applications of artificial manures were evident with the plant and first ratoon crops: but the removal of some 60 tons of cane in two years has brought about both nitrogen and potash deficiencies, and marked gains were recorded with the second ratoon crop. This block was ploughed out and sown to green manure during the spring of 1940, and the plan previously used for this field was employed once again to study still further the influence of the fallow on plantfood supplies.

## VARIETAL TRIAL—Co.290 *v.* P.O.J.213 (Second Ratoon Crop).

PLAN AND YIELDS.

| | | |
|---|---|---|
| P.O.J.213<br>30.0 | Co.290<br>27.0 | P.O.J.213<br>29.4 |
| Co.290<br>29.2 | P.O.J.213<br>26.3 | Co.290<br>28.4 |
| Co.290<br>29.0 | P.O.J.213<br>25.8 | P.O.J.213<br>27.8 |
| P.O.J.213<br>27.8 | Co.290<br>27.3 | Co.290<br>29.3 |
| Co.290<br>29.0 | P.O.J.213<br>29.0 | Co.290<br>31.8 |
| P.O.J.213<br>29.3 | Co.290<br>30.2 | P.O.J.213<br>31.0 |

*Block.*—B2.
*Harvested.*—August, 1940.
*Age of Crop.*—10 months.
*Plots.*—0·099 acre.
*Experimental Plan.*—Nine randomised blocks.

## TREATMENTS.

After harvesting the first ratoon crop in 1939, the crop residues were raked up and burnt. The block was then ratooned with a tractor grubber and fertilizer applied uniformly to all plots at the rate of 3 cwt. of Sugar Bureau No. 3 ratooning mixture per acre. Sulphate of ammonia was applied later as a top dressing at the rate of 1½ bags per acre.

## GROWTH NOTES.

As this block was cut rather late in the season of 1939 the ratoons came away at a time when the weather was warming up and rain was reasonably ample. Consequently a good start was made with the ratoon growth. This growth was maintained unchecked until January when a rather dry month held up development for a period. Further good growing weather in late summer and autumn ensured the crop. The P.O.J.213 appeared to be ahead throughout the crop growth, but this observation was based mainly on height of cane without taking into consideration the heavier stalks and stooling of the Co.290.

SUMMARY OF CROP YIELDS—PLANT, FIRST AND SECOND RATOON CROPS.

| Variety. | Plant Crop. | | First Ratoon Crop. | | Second Ratoon Crop. | |
|---|---|---|---|---|---|---|
| | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. |
| | Tons. | Per cent. | Tons. | Per cent. | Tons. | Per cent. |
| Co.290 .. .. | **34·9** | 12·5 | 28·6 | **15·5** | **29·0** | 13·3 |
| P.O.J.213 .. .. | 33·0 | **13·4** | **30·4** | 15·3 | 28·5 | **14·3** |

## DISCUSSION.

It is evident that both varieties are capable of producing very satisfactory crops on the Bundaberg red volcanic loam. In no year has either shown outstanding dominance, except perhaps in sugar content, where P.O.J.213 appears superior. In view of the much greater susceptibility of the latter to downy mildew disease, it is strongly recommended that Co.290 be planted where a variety of this type is desired.

## ROTATIONAL TRIAL (Plant and Ratoon Crops).

PLAN AND YIELDS.

| | | | | | |
|---|---|---|---|---|---|
| 0K<br>28.4 | 2K<br>34.2 | 1K<br>44.1 | 2K<br>48.5 | 0K<br>26.4 | 1K<br>29.6 |
| 2K<br>31.6 | 1K<br>33.0 | 0K<br>40.8 | 1K<br>49.9 | 2K<br>32.0 | 0K<br>28.1 |
| 1K<br>31.5 | 0K<br>30.9 | 2K<br>45.6 | 0K<br>47.2 | 1K<br>34.9 | 2K<br>33.6 |
| Sect. 3 | 2 | 1 | 1 | 2 | 3 |

*Block.*—B4.
*Harvested.*—August-September, 1940.
*Age of Crop.*—(1) 18 months, (2) and (3) 13 months.
*Variety.*—P.O.J.2878.
*Plots.*—0·236 acre, with guard rows of P.O.J.234.

## TREATMENTS.

This is a long-range trial, designed to provide information regarding the value of fallowing with cane production. The red volcanic lands of the Woongarra are subject to the development of "soil sickness" if cropped by the same variety over a long period of years. This was notably true when Q.813 was the standard variety.

The plan consists of dividing a large block into six strips, which are grouped in pairs for each of the three treatments:—(1) 18 months fallow with legumes, followed by plant and one ratoon crop of cane; (2) and (3) 6 months fallow with legumes, followed by plant, first and second ratoon crops of cane; when the area is subsequently replanted one of these sections will have P.O.J.2878 once again, but a fresh variety will be planted in the other.

It will be noted that the strips are again subdivided, so that the experiment serves also as a long range potash trial. The annual treatments are—

0K = no potash
1K = 150 lb. muriate of potash } in addition to uniform phosphate and nitrogen.
2K = 300 lb. muriate of potash

The area was uniformly planted to Poona pea late in 1937. The crop was ploughed under early in 1938, and Sections (2) and (3) were planted to cane. The central portion of the block later produced a winter crop of blue lupin, and a further crop of Poona pea in the early summer, prior to early planting in 1939, for 1940 harvest.

The plant crop from Sections (2) and (3) were harvested in 1939, and the first ratoon results are recorded at this time. Section (1) yields are from autumn plant cane. After harvesting in 1941, the entire block will be ploughed out and fallowed, as before, with green manure crops.

## GROWTH NOTES.

The ratoons on Sections (2) and (3) came away slowly in spring, 1939, owing to the late and dry winter. Ultimately, a good stand was developed and growth was normal right through to May with the exception of a check in January, 1940.

The February, 1939, plant on Section (1) made a good start, but was checked by the dry winter and spring of 1939. Growth during the summer of 1940 was good. After the 18 months legumes the physical condition of this block was excellent. Unfortunately, the weather conditions did not conform to the requirements of really good growth, and the crop produced is not above normal for an autumn planting.

SUMMARY OF CROP YIELDS—BY SECTIONS.

| Sections. | Plant Crop (1939). | Plant Crop (1940). | First Ratoon Crop (1940). |
|---|---|---|---|
| | Tons. | Tons. | Tons. |
| (2) and (3) .. .. .. .. | 36·5 | .. | 31·2 |
| (1) .. .. .. .. .. | .. | 46·0 | .. |

EFFECTS OF FERTILIZERS.

| Treatment. | Sections (2) and (3). | | | | Section (1). | |
|---|---|---|---|---|---|---|
| | Plant Crop. | | First Ratoon Crop. | | Plant Crop. | |
| | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. |
| | Tons. | Per cent. | Tons. | Per cent. | Tons. | Per cent. |
| No potash .. | 37·7 | 12·4 | 28·5 | 17·9 | 44·0 | 15·8 |
| 150-lb. potash .. | 36·4 | 12·3 | 32·3 | 17·4 | 47·0 | 16·9 |
| 300-lb. potash .. | 35·4 | 11·8 | 32·9 | 17·4 | 47·1 | 16·4 |

## DISCUSSION.

This long-range experiment is already providing some very interesting data. The plant cane yield, following 18 months fallow, was 46 tons of cane per acre, which is exceptionally good, though there is no basis for direct comparison for the influence of treatment. In addition, the natural potash deficiency of the land became evident in the ratoons of Sections (2) and (3), and on Section (1) the plant cane seems to have responded to the treatment.

Some extremely valuable data are likely to accrue from this trial over a period of years, and these will be discussed from time to time as fresh crop data become available.

## KINDS OF NITROGEN AND INTERSPACING TRIAL
### (Plant Crop).

PLAN AND YIELDS.

| | | | | | |
|---|---|---|---|---|---|
| Interspace 4ft. 9 in. 10 rows | 44.8 | 48.8 | 43.5 | 44.8 | 52.3 |
| | A | E | B | D | C |
| 4 ft. 12 rows | 50.8 | 52·0 | 50.3 | 47.5 | 50.3 |
| 4 ft. .. | 53.5 | 50.5 | 46.5 | 53.0 | 45.4 |
| | D | C | A | B | E |
| 4 ft. 9 in. .. | 54.3 | 52.3 | 41.1 | 50.5 | 44.5 |
| 4 ft. 9 in. .. | 52.8 | 50.9 | 50.3 | 48.3 | 47.5 |
| | C | B | D | E | A |
| 4 ft. .. | 51.2 | 50.0 | 49.2 | 46.5 | 45.2 |
| 4 ft. 9 in. .. | 46.0 | 49.8 | 44.8 | 48.5 | 50.5 |
| | E | D | C | A | B |
| 4 ft. .. | 48.0 | 52.3 | 45.2 | 53.2 | 49.5 |
| 4 ft. .. | 51.4 | 51.2 | 45.5 | 47.2 | 52.8 |
| | B | A | E | C | D |
| 4 ft. 9 in. .. | 46.3 | 50.5 | 39.4 | 42.8 | 51.2 |

*Harvested.*—July, 1940.

*Age of Crop.*—17 months.

*Plan.*—Latin square for nitrogen and half plot method for interspace.

*Plots.*—Main plots 0·087 acre.

*Variety.*—P.O.J.2725.

*Fertilizer.*—All plots received uniformly 3 cwt. per acre of Sugar Bureau No. 3 planting mixture.

Nitrogen dressings consisted of—

A. No. nitrogen.

B. 200 lb. per acre ammonium sulphate.

C. 264 lb. per acre sodium nitrate.

D. 342 lb. per acre dried blood.

E. 200 lb. per acre cyanamide.

The dried blood was applied at planting time—February—but the other nitrogenous fertilizers were all applied in September. The cyanamide was applied in the interspaces and scarified in.

## GROWTH NOTES.

After ploughing out the stools from the preceding experiment on this block Poona pea was sown and a fairly good crop obtained. This was ploughed under in January, 1939, and the block planted a month later when decomposition of the legume was complete. The plan is essentially a 5 × 5 Latin square inquiring into the value of different forms of nitrogen, and superimposed on this is an interspace trial with 4 ft. *v.* 4 ft. 9 in. interspaces. The large number of replications is necessary to obtain interspace differences, while the Latin square is essential for the same reason in the nitrogen treatments.

The crop got away to a good start and was well advanced by the winter. A dry and cool winter and spring checked the growth, but during the summer and autumn of 1940 it made excellent headway. Stooling was particularly good. During the late autumn of 1940 the entire block ran up to abortive arrows, although no arrows emerged. A very satisfactory crop of high sugar content was produced.

CROP YIELDS.

| Treatments. | Cane per Acre. | C.C.S. in Cane. |
|---|---|---|
| | Tons. | Per cent. |
| 4 ft. 9 in. Interspace .. .. .. | 47·9 | 15·28 |
| 4 ft. 0 in. Interspace .. .. .. | 49·5 | 15·22 |
| No nitrogen .. .. .. .. | 47·9 | 15·50 |
| Sulphate of ammonia .. .. .. | 49·6 | 15·22 |
| Sodium nitrate .. .. .. .. | 48·9 | 15·30 |
| Dried blood .. .. .. .. | 50·6 | 14·80 |
| Cyanamide .. .. .. .. | 46·4 | 15·44 |

## DISCUSSION.

These results confirm the view that for erect growing varieties an interspace narrower than 4 ft. 9 in. leads to increased crop yields.

The results from nitrogenous manures are very interesting. Firstly, it is unusual to record plant crop gains from nitrogen and the red volcanic loam, following a fallow with green manure. But there is definite evidence of this gain, which also suggests that dried blood was the best source of N. It will be recalled, however, that this was the only form of N applied at planting time, and the earlier application would doubtless exert its influence. Sulphate of ammonia was slightly in advance of nitrate of soda, while cyanamide was distinctly inferior. The C.C.S. values suggest that the slow action of dried blood, even when applied early, depresses the final C.C.S.

## FERTILIZER AND PLANT RESIDUE TRIAL
### (First Ratoon Crop).

PLAN AND YIELDS.

| | | | | |
|---|---|---|---|---|
| PK | NK | C | NPK | (a) |
| 22.8 | 34.0 | 20.6 | 36.8 | |
| NPK | C | PK | NK | (b) |
| 33.2 | 23.4 | 22.1 | 37.4 | |
| NK | NPK | C | PK | (c |
| 30.7 | 30.1 | 21.4 | 31.6 | |
| C | PK | NPK | NK | (c) |
| 23.0 | 25.4 | 30.1 | 36.5 | |
| PK | NK | C | NPK | |
| 25.1 | 33.8 | 27.3 | 36.2 | (b |
| NPK | C | NK | PK | |
| 30.8 | 28.2 | 35.4 | 31.0 | (a) |

*Block.*—E4.

*Harvested.*—September, 1940.

*Age of Crop.*—13 months.

*Plots.*—0·1074 acre.

*Experimental Plan.*—Six randomised blocks.

## TREATMENTS.

After harvesting the plant crop in spring, 1939, the trash was burnt on the (*a*) and (*b*) plots. On the (*c*) plots the trash and tops were raked into alternate interspaces. The bare interspaces were then ratooned with the grubber as were also all interspaces of the (*a*) and (*b*) plots. Fertilizer was then applied evenly by hand according to the following formula:—

N = 225 lb. sulphate of ammonia per acre.

P = 200 lb. superphosphate per acre.

K = 200 lb. of muriate of potash per acre.

### GROWTH NOTES.

Ratoons were slow in coming away owing to the late winter and dry spring after harvesting the plant crop. Ultimately a good ratoon was established and growth was satisfactory until the end of April, 1940, with the exception of a check during January. Fertility differences were noticeable during the progress of growth. There was no apparent difference in the trash and no-trash areas during the year.

SUMMARY OF CROP YIELDS.

| Treatment. | Plant Crop. | | First Ratoon Crop. | |
|---|---|---|---|---|
| | Cane per Acre. | C.C.S. in Cane. | Cane per Acre. | C.C.S. in Cane. |
| | Tons. | Per cent. | Tons. | Per cent. |
| Check .. .. | 35·0 | 13·7 | 24·0 | 17·6 |
| NK .. .. .. | 36·8 | 13·5 | 34·6 | 17·6 |
| PK .. .. .. | 35·6 | 13·6 | 26·3 | 17·2 |
| NPK .. .. | .. | .. | 32·9 | 17·4 |
| Trash burnt .. | .. | .. | 29·9 | 17·6 |
| Trash conserved .. | .. | .. | 28·6 | 17·1 |

### DISCUSSION.

Little evidence can be expected, for some years, from the treatment of crop residues, &c., although the conservation of trash appears to have depressed the C.C.S. of the first ratoons.

There were outstanding results from fertilizer, due mainly to the use of sulphate of ammonia. The block is therefore a happy choice for the type of long-distance trial under review.

### OBSERVATIONAL VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

| | | | | |
|---|---|---|---|---|
| G.10 | Co.290 | G.16 | Co.290 | H.1 |
| 27.6 | 26.6 | 31.8 | 27.4 | 24.0 |
| H.10 | G.15 | H.3 | H.15 | G. 35 |
| 21.6 | 23.2 | 29.1 | 32.2 | 31.8 |
| G.28 | G.34 | H.4 | H.16 | G.32 |
| 36.0 | 30.9 | 24.0 | 31.2 | 27.4 |
| H.9 | Co.290 | H.6 | Co.290 | H.23 |
| 33.6 | 32.0 | 44.2 | 30.4 | 29.1 |

*Block.*—F.
*Harvested.*—September, 1940.
*Age of Crop.*—13 months.
*Plots.*—0·052 acre.
*Varieties.*—Seedling canes *v.* Co.290.

### TREATMENTS.

After ploughing out the previous crop on this block, in spring, 1938, the block was sown with Sudan grass and white panicum for hay purposes. Excellent crops were obtained and the block was ploughed again in the autumn. It was left in bare fallow during the winter of 1939, and planted with the above trial in August, 1939. All plants were from the Experiment Station and were of good quality. Owing to the late winter and low temperatures a poor strike was obtained, although the block was spray irrigated for a strike. The block was supplied in October. At time of planting Sugar Bureau No. 3 mixture was applied in the drills at the rate of 4 cwt. per acre. Later 1½ bags per acre of sulphate of ammonia were used as top dressing.

### GROWTH NOTES.

Once the winter was over the October rains gave the crop a satisfactory start, and this early growth was maintained until May, 1940, except for the dry period during January. Maturity data were obtained on all varieties and ultimately four were selected to be planted in a Latin square trial.

CROP YIELDS.

| Variety. | Cane per Acre. | C.C.S. in Cane. |
|---|---|---|
| | Tons. | Per cent. |
| G.10 .. .. .. .. .. | 27·6 | 14·8 |
| G.15 .. .. .. .. .. | 23·2 | 16·0 |
| G.16 .. .. .. .. .. | 31·8 | 15·3 |
| G.28 .. .. .. .. .. | 36·0 | 10·3 |
| G.32 .. .. .. .. .. | 27·4 | 13·7 |
| G.34 .. .. .. .. .. | 30·9 | 16·9 |
| G.35 .. .. .. .. .. | 31·8 | 13·9 |
| H.1 .. .. .. .. .. | 24·0 | 15·1 |
| H.3 .. .. .. .. .. | 29·1 | 13·8 |
| H.4 .. .. .. .. .. | 24·0 | 13·4 |
| H.6 .. .. .. .. .. | 44·2 | 8·7 |
| H.9 .. .. .. .. .. | 33·6 | 9·3 |
| H.10 .. .. .. .. .. | 21·6 | 13·8 |
| H.15 .. .. .. .. .. | 32·2 | 12·1 |
| H.16 .. .. .. .. .. | 31·2 | 15·4 |
| H.23 .. .. .. .. .. | 29·1 | 13·4 |
| Co.290 (4 plots) .. .. .. .. | 29·0 | 11·0 |

LABORATORY WORK PERFORMED DURING THE YEAR 1940–41.

| | |
|---|---|
| Cane Samples— | |
| Station .. .. .. .. .. .. .. | 376 |
| Farmers' .. .. .. .. .. .. .. | 368 |
| Irrigation Waters .. .. .. .. .. .. | 49 |
| Total .. .. .. .. .. | 793 |

SUMMARY OF 1940 CANE CROP.

| | Tons. |
|---|---|
| Cane sent to Mill .. .. .. .. .. .. | 807·7 |
| Cane used for Plants .. .. .. .. .. | 11·5 |
| Cane used for Samples .. .. .. .. .. | 3·0 |
| Total .. .. .. .. .. | 822·2 |
| Acres harvested .. .. .. .. .. | 23·7 |
| Average Tons Cane per Acre .. .. .. | 34·7 |

Both tonnage harvested and average yield of cane per acre are new records for this station. The previous best were 798·4 tons and 34·6 tons respectively.

## REPORT OF THE COMMITTEE ON SEEDLING PROPAGATION.

By Mr. ARTHUR F. BELL, Assistant Director, Chairman.

For the first time since seedling raising was commenced by the Bureau, a year's quota of seedlings has been germinated from stored fuzz. With the exception of a few late crosses sent to Bundaberg, all 1941 seedlings are being produced from seed collected during the winter of 1940. The seed resulting from the 1941 cross-pollination operations has been placed in cold storage. There is now available much more than sufficient seed for a full year's programme, thus ensuring continuity of work in the event of an unfavourable season, or other cause, preventing the carrying out of a normal cross-pollination programme in 1942 and/or 1943.

Of the new series "Q" seedlings, Q.2 has maintained its position in the north. This variety has very strict limitations, and, generally speaking, should be confined to areas liable to flooding or to heavy infestation by the cane beetle borer pest; it also appears to suffer less ill effect after grub damage than most varieties. The area planted to Q.10 has been multiplied in the far north during the current planting season; although it has a definite tendency to lodge and shoot at the top eyes, its high sugar content and excellent rapid germination and ratooning have attracted favourable attention. Q.10 should not be grown on first class land, nor should it usually be planted early, but under suitable conditions it will prove a valuable addition to the varietal list, especially as a substitute for the gumming susceptible H.Q.426 and Pompey. The extension of Q.20 plantings has been retarded by its lodging habit and by its uncertain germination, especially in cold weather or after heavy arrowing; the exceptionally high purity of this variety makes it desirable that plantings be made in the autumn. Q.25 is being rapidly extended at Bundaberg, although susceptibility to mosaic may limit the range of utility of this seedling in the Bundaberg district. New seedlings to be advanced during the current season to district propagation in the northern, central, and southern districts respectively, are:—Q.44 (Field Cross), Q.28 (Co.290 x Q.1098), and Q.42 (Co. 281 x (Badila x S.C. 12/4)).

An unusually heavy and prolonged wet season, preceded by a dry spring and followed by very cold weather, seriously interfered with normal growth of seedlings at Mackay, while a late cyclone did considerable damage at Bundaberg.

#### 1941 CROSS-POLLINATION SEASON.

Following the severe wet season extending over the first four months of the year, the 1941 crossing programme was favoured by the resultant heavy arrowing. The termination of the wet season was abrupt, with the result that the actual cross-pollination was carried out in suitably fine weather. The correlation between arrowing and intensity and length of wet season has been pointed out in previous reports, and the experience of the season just concluded lends further support to the claims made. Weather data (Meringa) and comments on incidence of arrowing, for the five-year period 1937-1941, are submitted in Table I.

TABLE I.

RELATION OF ARROWING TO WET SEASON CONDITIONS.

| Year. | Rainfall. | January. | February. | March. | April. | Totals. | Arrowing. |
|---|---|---|---|---|---|---|---|
| 1937 | Rain in Inches | 8·4 | 4·7 | 16·4 | 4·9 | 32·4 | Poor |
| | Wet Days | 18 | 15 | 20 | 6 | 59 | |
| 1938 | Rain in Inches | 18·8 | 18·9 | 2·7 | 0·5 | 40·9 | Poor |
| | Wet Days | 14 | 18 | 9 | 6 | 47 | |
| 1939 | Rain in Inches | 26·1 | 36·9 | 34·7 | 9·3 | 107·0 | Excellent |
| | Wet Days | 19 | 14 | 19 | 22 | 74 | |
| 1940 | Rain in Inches | 12·7 | 18·9 | 34·4 | 7·3 | 73·3 | Excellent |
| | Wet Days | 14 | 21 | 25 | 17 | 77 | |
| 1941 | Rain in Inches | 12·2 | 24·2 | 15·4 | 18·7 | 70·5 | Excellent |
| | Wet Days | 25 | 19 | 23 | 26 | 93 | |

The favourable arrowing season permitted the use of 36 female parents, and 33 males, in a total of 178 different combinations. It will be noted that the number of matings made has steadily increased over the past few years, in spite of the fact that a considerable number of matings are discarded each year, as a result of unsatisfactory performance of progeny, and are not repeated further. Details of combinations made during the 1941 season are set out in Table II.

TABLE II.

CROSSES EFFECTED DURING 1941 CROSS-POLLINATION SEASON.

| Female Parent. | Male Parent. |
|---|---|
| A.289 | Q.33 |
| Atlas | A.285, Comus, H.Q.409, K.39, Q.33, Q.34, Q.36, Q.39 |
| Badila | B.147, E.K.28, H.Q.409, J.B.1, J.B.11, K.39, K.95 28 N.G.251, 28 N.G.253, P.O.J.2878, Q.21, Q.30, Q.31, Q.32, Q.39, Q.813, S.C.12/4, S.W.499, Uba Marot |
| Cato | Co.290, P.O.J.2878, S.C.12/4. |
| Co.270 | Badila, Q.33, Q.34 |
| Co.281 | E.K.28, Q.36, Q.1098 |
| Co.515 | Q.39 |
| C.H.64/21 | Q.33, Q.39 |
| *Erianthus* Sp. | Q.33 |
| H.456 | Q.33 |
| J.B.9 | Q.33 |
| Juno | A.285, K.39, Q.36 |
| Katha | Q.32, Q.34 |
| Korpi | A.285, B.147, Co.290, H.Q.409, J.B.1, P.O.J.2878, Q.21, Q.33, Q.39, S.C.12/4, S.W.499, Uba Marot |
| Mahona | J.B.1 |
| N.G.16 | S.W.499 |
| N.G.24 | Co.290, E.K. 28, H.Q.409, J.B.1, Q.30, Q.813 |
| Oramboo | Co.290, E.K.28, H.Q.409, P.O.J.2878, Q.21, Q.39 |
| Pompey | E.K.28, J.B.1, Q.33 |
| P.O.J.100 | Q.39 |
| P.O.J.213 | P.O.J.2878, Q.36 |
| P.O.J.2364 | A.285, Badila, Co.290, D.1135, E.K.28, H.Q.409, K.39, K.95, M.1900 S., P.O.J.2878, Q.33, Q.34, Q.36, Q.1098, S.W.499, X.3 |
| P.O.J.2714 | Q.39 |
| P.O.J.2725 | Badila, Co.290, E.K.28, Jason, M.1900 S., P.O.J. 2878, Q.21, Q.32, Q.33, Q.34, Q.38, Q.39, S.W.499, X. 3 |
| P.O.J.2727 | Q.33 |
| P.O.J.2875 | Q.39 |
| P.O.J.2878 | Badila, Co.290, Q. 34, Q. 39, S.C.12/4, S.W.499 |
| P.O.J.2883 | A.285, E.K.28, H.Q.409, Q.21, Q.34, Q.36 |
| Q.10 | B.147, Co.290, J.B.1, K.39, P.O.J.2878, Q.21, Q.30 |
| Q.13 | Badila, J.B.11 |
| Q.25 | A.285, Co.290, E.K.28, H.Q.409, P.O.J.2878, Q.34 |
| Q. 27 | Badila, E.K.28, H.Q.409, J.B.1, Q.32, Q.33, Q.813, Q.1098 |
| Q.37 | Co.290, P.O.J.2878, Q.34, Q.1098 |
| Q.44 | Badila, J.B.1, Q.31, Q.32 |
| S.J.4 | A.285, A.288, B.147, Co.270, Co.290, D.1135, E.K.28, H.Q.409, Jason, J.B.11, K.39, K.95, P.O.J.2878, Q.21, Q.30, Q.33, Q.34, Q.36, S.C.12/4, Uba Marot |
| 31–1389 | Co.290, Q.34 |

(*Note.*—The varieties designated "A.," "J.," "J.B.," and "K." are Queensland raised seedlings which have been selected for breeding purposes, but are not as yet sufficiently tested to warrant advancement to "Q." status.)

Heavy arrowing in the newly established Meringa arrowing plots obviated the necessity for the transport of more than 10 per cent. of the required arrows from the 20 miles distant arrowing plot at Freshwater, thus materially conserving labour and transport. For the first time the arrows of all crosses made with saccharum species were maintained wholly in preservative solution during the entire period of pollination and ripening of seed. As usual, crossing stands were suitably spaced through an area of light forest, but increasing use was made of crossing lanterns. Behaviour of arrows in solution was very satisfactory, not a single arrow being lost through death or premature falling of flowers. As mentioned earlier, this fuzz is being carried forward in storage for use in 1942.

## 1940 ("B") SERIES SEEDLINGS.

The 1940 or "B" series seedlings were germinated from a combination of stored and fresh fuzz. Some 23,000 seedlings were planted out on the three stations in the ordinary manner, while many thousands of excess seedlings were "mass planted" in the manner described in previous reports. Forty-three crosses represented by more than 100 seedlings per cross were planted in the field at Meringa, 19 at Mackay, and 22 at Bundaberg. The Committee retains the view that under Queensland conditions it is better to limit the maximum number of seedlings per cross to some hundreds, and so increase the number of crosses treated, rather than to concentrate on a few major crosses. Field plantings at Meringa necessarily included progeny from crosses made for the purpose of providing more suitable breeding material rather than for commercial purposes. Purely noble progeny comprised one-third of the seedlings raised at Meringa and slightly less than one-third at Mackay, but no purely noble (i.e., *S. officinarum*) crosses were germinated at Bundaberg.

## SELECTED SEEDLINGS.

Examination of the 1939 ("A") series seedlings by groups of observers at each station resulted in the first selection of some 221 individuals (Meringa, 83; Mackay, 93; Bundaberg, 45), which were then planted in the fields in accordance with the standard plan. One-third of the selections made at Bundaberg were progeny of the cross P.O.J.2878 × Co.290 but at the other two stations the selections were well distributed over a number of crosses.

The following selections were made from the 40-sett plots (1938 germinated fuzz) and planted in yield-observation trials:—

*Meringa*: K.1, 2, 6, 9, 15, 16, 19, 24, 26, 55, 56, 58, 74, 90 and 94; *Mackay*: I.2, 3, 12, 15, 20, 21, 22, 25, 26, 31, 51, 53, 62, 68 and 70; *Bundaberg*: I.6, 9, 11, 12, 15, 25, 27, 31, 35, 38, 41, 43, 46, 49, 62 and 64. At Meringa the cross S.J.4 × ½ *S. robustum* yielded two-thirds of these selections, while P.O.J.2725 × Co.290 and P.O.J.2878 × Co.290 (and the reciprocal) were the most favoured at Mackay and Bundaberg respectively.

Selections from the standard yield-observation trials advanced to Latin Square trials comprised:—

*Meringa*: J.37, J.39, I.41 and I.118; *Mackay*: G.48, H.43, H.45 and H.63; *Bundaberg*: G.10, G.16, G.34 and H.16. The Meringa seedling I.67 (see below) was also selected for trial as a special-purpose cane.

In the past it has been the practice to make all selections on the basis of performance in the plant crop. However, owing to the increasing importance of ratooning as a determining factor, and in order to obtain more time for the carrying out of preliminary disease resistance trials, it has been decided that henceforth selections from the yield-observation and Latin Square trials will be made from ratoons. It is appreciated that ratoon selection would also be profitable in the case of first and second year seedlings, but considerations of area prevent this being put into practice.

Since the compilation of the previous Annual Report the following seedlings have been advanced to "Q" status:—

| Seedling. | Parentage. | Present Status. |
|---|---|---|
| Q.30 | Black Cheribon x *S. robustum* (28 N.G.251) | Breeding Cane |
| Q.31 | Oramboo x H.Q.409 | ,, ,, |
| Q.32 | Badila (N.G.15) x Q.813 | ,, ,, |
| Q.33 | Badila (N.G.15) x S.C.12/4 | ,, ,, |
| Q.34 | ditto | ,, ,, |
| Q.35 | N.G.24 (Goru) x Wailuku 4 | ,, ,, |
| Q.36 | P.O.J.2878 x S.C.12/4 | ,, ,, |
| Q.37 | P.O.J.2878 x S.W.499 | ,, ,, |
| Q.38 | S.C.12/4 Self | ,, ,, |
| Q.39 | P.O.J.2878 x Badila (N.G.15) | ,, ,, |
| Q.40 | Black Cheribon x *S. robustum* (28 N.G.251) | ,, ,, |
| Q.41 | Co.515 x P.O.J.2940 | ,, ,, |
| Q.42 | Co.281 x Q.33 | Farm Trials, S.Q. |
| Q.43 | P.O.J.2725 x S.C.12/4 | ,, ,, |
| Q.44 | Field Cross | Yield Propagation Trials, N.Q. |
| Q.45 | P.O.J.2878 x S.C.12/4 | Farm Trials, Mackay |
| Q.46 | Oramboo (14 N.G. 190) x Badila (N.G. 15) | Rich Land Trials, N.Q. |

## EXPERIMENTAL.

As recorded earlier in this report, 1940 fuzz was germinated on a large scale in 1941, following twelve months' cold storage. A total of 112 crosses were stored in sealed moisture-free containers at temperatures ranging around 40 degrees F. All containers opened with fuzz in perfect condition and highly satisfactory germinations were obtained.

Fuzz from seven crosses made in 1939 and stored for two years was also sown; germinations were comparable with the original and seedlings grew normally, many being later planted in the field. A planting of stored fuzz was also carried out at Meringa early in the year for the purpose of observing the behaviour of seedlings planted in the field at a time corresponding to "early" or autumn planting; since autumn planting is coincident with the arrowing period, this could only be carried out with stored fuzz.

The control of arrowing has again been given some attention. There does not appear to be available any convenient practical method of stimulating or advancing arrowing, but it would appear that it may be very usefully retarded by the simple expedient of defoliation. Following last year's preliminary trials, plots of plant cane of the varieties P.O.J.2364, P.O.J.2725 and Co.290 were defoliated on 1st February and again 28 days later. All three varieties normally arrow profusely in a favourable season, and in the untreated control plots arrows were produced by 68 per cent., 97 per cent. and 84 per cent. of the stalks respectively. The double defoliation was obviously too severe for both P.O.J.2364 and Co.290 and no arrows were produced in the treated plots. In the treated P.O.J.2725 plots, however, some two-thirds of the stalks arrowed but, whereas by 21st May no less than 87 per cent. of the untopped stalks had arrowed, only 6 per cent. topped stalks had arrowed by that time. In other words, the arrowing of the untreated plot was virtually complete when the cane in the treated plot commenced to arrow; arrows suitable for crossing purposes were still being produced in the treated plot when the setting up of new crosses was discontinued on 17th June. For the 1942 season it is proposed to test the effect of a single defoliation, or two partial defoliations, on the arrowing of P.O.J.2364 and Co.290.

During the past three years data has been accumulated dealing with the relationship between number of stalks per stool in the original seedlings and the average number of stalks per stool in the first vegetative propagation (40-sett plots). An analysis of this preliminary data has indicated that under local conditions the odds are approximately 3 to 1 that a difference of more than three stalks per stool will result in a positive difference in number of stalks per stool in the first vegetative propagation therefrom. The data for the comparison of refractometer brix of original seedlings and the cane from the first vegetative propagation was not satisfactory owing to fluctuations due to soil gradients in the fields and henceforth it is proposed to record, not an absolute figure, but the ratio to the nearest standard, plots of the standard variety being suitably distributed.

## Varietal Statistics.

The constitution of the 1940 crop, expressed both as tonnages of each variety crushed, and percentage of district and State crops, is set out in Table IV. On comparison with the similar table presented with last year's report it will be seen that Badila, while remaining stationary around 33 per cent., is still much the most important sugar-cane variety in Queensland. P.O.J.2878, the second variety, has increased its lead over 1900 Seedling, having advanced from 12.2 to 13.7 per cent., while 1900 Seedling declined from 12 to 10 per cent.

The Bureau-raised seedling S.J.2, a variety of moderate vigour but exceptionally high sugar content, has increased rapidly in popularity in the Lower Burdekin and Mackay districts, advancing from 2.45 and 3.98 to 5.64 and 6.21 per cent. of the district crops respectively. P.O.J.2878 and Co.290 have forged ahead in the southern districts and constituted no less than 78.93 per cent. of the crop in the areas of Bundaberg and south; at the same time P.O.J.213 has steadily declined in importance.

A notable absentee in the current list is the variety Uba, of which less than 1,000 tons were crushed in the whole State.

In Table III. is set out the composition of the crop on the basis of the country of origin of the constituent varieties. New Guinea and Queensland varieties comprised some 54 per cent., while Javan varieties (mainly P.O.J.2878 and E.K.28) comprised a quarter of the crop.

## Introduction of Varieties.

Six varieties were imported from abroad and three from New South Wales during the year; details of these importations will be found in the report of the Division of Entomology and Pathology (page 22). From the cane-breeding point of view chief interest centres on the five varieties containing "Turkestan" blood. These canes are derivatives of a variety of *S. spontaneum* found in Turkestan and which proved extraordinarily resistant to cold in the United States. It is our intention to cross these back on to noble canes in Queensland. The variety Comus, introduced from New South Wales, is showing a considerable degree of promise in trial plantings in the Mackay district.

Table III.

Composition of 1940 Crop on Basis of Country of Origin of Varieties.

| Country of Origin. | Tonnage Crushed. | Proportion of Crop. |
|---|---|---|
| | | Per cent. |
| New Guinea .. .. .. .. | 1,776,468 | 34·29 |
| Java .. .. .. .. | 1,244,101 | 24·01 |
| Queensland .. .. .. .. | 1,019,831 | 19·69 |
| Mauritius .. .. .. .. .. | 520,634 | 10·05 |
| India .. .. .. .. .. | 474,557 | 9·16 |
| Fiji .. .. .. .. .. | 76,428 | 1·48 |
| British West Indies .. .. .. | 57,015 | 1·10 |
| Unclassified Varieties .. .. .. | 11,610 | 0·22 |
| Total .. .. .. | 5,180,644 | 100·00 |

Table IV.—Queensland Cane Variety Census—Tons Cane Harvested, 1940.

| Variety. | Mossman to Townsville. | | Giru and Burdekin. | | Mackay. | | Bundaberg and South. | | State Total. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tons. | Per Cent. Crop. | Tons. | Per Cent. Crop. | Tons. | Per Cent. Crop. | Tons. | Per Cent. Crop. | Tons. | Per cent. Crop. |
| Badila .. .. .. | 1,228,364 | 57·98 | 363,204 | 63·70 | 98,118 | 7·70 | 184 | 0·02 | 1,689,870 | 32·62 |
| P.O.J. 2878 .. .. .. | 87,592 | 4·13 | .. | .. | 43,343 | 3·40 | 578,972 | 47·57 | 709,907 | 13·70 |
| M. 1900 S. .. .. .. | .. | .. | .. | .. | 502,288 | 39·40 | 17,284 | 1·42 | 519,572 | 10·03 |
| Co. 290 .. .. .. | 170 | 0·01 | .. | .. | 92,653 | 7·27 | 381,734 | 31·36 | 474,557 | 9·16 |
| E.K. 28 .. .. .. | .. | .. | 104,030 | 18·25 | 225,467 | 17·69 | .. | .. | 329,497 | 6·36 |
| H.Q. 426 .. .. .. | 185,939 | 8·78 | 37,226 | 6·53 | 104,209 | 8·17 | .. | .. | 327,374 | 6·32 |
| H.Q. 409 .. .. .. | 188,267 | 8·89 | .. | .. | 54 | 0·01 | .. | .. | 188,321 | 3·64 |
| S.J. 4 .. .. .. | 161,110 | 7·60 | 7,869 | 1·38 | 55 | 0·01 | .. | .. | 169,034 | 3·26 |
| Q. 813 .. .. .. | 30,882 | 1·46 | .. | .. | 64,165 | 5·03 | 30,324 | 2·49 | 125,371 | 2·42 |
| S.J. 2 .. .. .. | 10,680 | 0·50 | 32,162 | 5·64 | 79,226 | 6·21 | .. | .. | 122,068 | 2·36 |
| P.O.J. 213 .. .. .. | .. | .. | .. | .. | 786 | 0·06 | 113,007 | 9·28 | 113,793 | 2·20 |
| Pompey .. .. .. | 76,300 | 3·60 | .. | .. | 128 | 0·01 | .. | .. | 76,428 | 1·48 |
| Oramboo .. .. .. | 19,031 | 0·90 | .. | .. | 9,513 | 0·75 | 13,420 | 1·10 | 41,964 | 0·81 |
| Korpi .. .. .. | 12,629 | 0·60 | 13,350 | 2·34 | 667 | 0·05 | 12,773 | 1·05 | 39,419 | 0·76 |
| P.O.J. 2725 .. .. .. | 1,151 | 0·05 | 3,023 | 0·53 | 16,382 | 1·29 | 18,291 | 1·50 | 38,847 | 0·75 |
| D. 1135 .. .. .. | 24,133 | 1·14 | .. | .. | 315 | 0·02 | 12,293 | 1·01 | 36,741 | 0·71 |
| P.O.J. 2714 .. .. .. | 711 | 0·03 | 2,129 | 0·37 | 28,434 | 2·23 | 3,628 | 0·30 | 34,902 | 0·67 |
| Juno .. .. .. .. | 33,121 | 1·56 | .. | .. | .. | .. | .. | .. | 33,121 | 0·64 |
| Q. 2 .. .. .. .. | 22,360 | 1·06 | .. | .. | .. | .. | .. | .. | 22,360 | 0·43 |
| P.O.J. 234 .. .. .. | .. | .. | .. | .. | .. | .. | 17,155 | 1·41 | 17,155 | 0·33 |
| B. 147 .. .. .. | 15,950 | 0·75 | .. | .. | .. | .. | .. | .. | 15,950 | 0·31 |
| H.Q. 285 .. .. .. | .. | .. | .. | .. | 3,598 | 0·28 | 8,146 | 0·67 | 11,744 | 0·23 |
| Brutus .. .. .. | 7,665 | 0·36 | .. | .. | .. | .. | .. | .. | 7,665 | 0·15 |
| B. 208 .. .. .. | .. | .. | 4,324 | 0·76 | .. | .. | .. | .. | 4,324 | 0·08 |
| Vulcan .. .. .. | 4,101 | 0·19 | .. | .. | .. | .. | .. | .. | 4,101 | 0·08 |
| Q. 20 .. .. .. .. | .. | .. | 151 | 0·03 | 3,752 | 0·29 | .. | .. | 3,903 | 0·07 |
| Mahona .. .. .. | .. | .. | .. | .. | .. | .. | 2,969 | 0·24 | 2,969 | 0·06 |
| S.J. 7 .. .. .. | .. | .. | 2,502 | 0·44 | .. | .. | .. | .. | 2,502 | 0·05 |
| Nanemo .. .. .. | 2,246 | 0·11 | .. | .. | .. | .. | .. | .. | 2,246 | 0·04 |
| Hector .. .. .. | 2,267 | 0·11 | .. | .. | .. | .. | .. | .. | 2,267 | 0·04 |
| M. 189 .. .. .. | 144 | 0·01 | .. | .. | 806 | 0·06 | 112 | 0·01 | 1,062 | 0·02 |
| Others .. .. .. | 3,675 | 0·18 | 160 | 0·03 | 900 | 0·07 | 6,875 | 0·57 | 11,610 | 0·22 |
| Total .. .. .. | 2,118,488 | 100·00 | 570,130 | 100·00 | 1,274,859 | 100·00 | 1,217,167 | 100·00 | 5,180,644 | 100·00 |

# REPORT OF THE DIVISION OF ENTOMOLOGY AND PATHOLOGY.

Mr. Arthur F. Bell, Assistant Director.

## Introduction.

During the period under review the general disease position showed further improvement, while the damage caused by pests increased somewhat as a result of a build-up in populations of the northern cane grub in certain areas; other pests were maintained at comparatively low intensity. Generally effective control measures were carried out by the eight compulsory Disease Control Boards, twelve compulsory Pests Boards and six voluntary Pests Boards.

The enforcement of the amended Sugar Experiment Stations Act is now proceeding quietly and effectively. Odd stools of discarded varieties naturally continue to be found, but little difficulty is being experienced in having these promptly eradicated; only one prosecution was made in connection with disapproved varieties during the year.

Investigational work has been greatly restricted during the past year owing to the necessity for undertaking work in other branches of sugar-cane agriculture, following the depletion of staffs by calls to military duties.

## Cane Pests and Cane Disease Control Boards.

The seventh conference of Cane Pests Boards was held in Ingham on 1st May, 1941, and was attended by thirty-two delegates from the Pests Boards and five officers from this Bureau. During the course of proceedings nine papers were presented by delegates and discussed at length; chief interest centred around the discussion of methods of transport and storage of carbon disulphide, and details of operation of the Blundell Knapsack Injector. Other papers dealt with the distribution and survival of the northern cane grub (*Lepidoderma albohirtum*), possible diluents for carbon disulphide, measures for the control of the Frenchi grub (*Lepidiota frenchi*), analysis of stomach contents of the giant toad (*Bufo marinus*) as an indication of its role in pest control, and toxicity of red squills to rats. It was resolved that the 1942 conference should be held in Tully.

An event of considerable importance was the holding of a school of instruction by the Pathology staff for Supervisors and Inspectors of Cane Disease Control Boards. This school was held at the Bundaberg Sugar Experiment Station during the period 12th-16th May, and was attended by fifteen officers of seven Boards as well as by Plantation representatives. The course covered the causation, symptoms, and methods of control of plant diseases in general, and major sugar-cane diseases in particular. Specimens of all the more important cane diseases in Queensland were assembled and the officers were given an opportunity of familiarising themselves with the symptoms of diseases not present within their territory; they will consequently be in a very much better position to recognise new diseases than heretofore.

## The Greyback Cane Beetle (*Lepidoderma albohirtum* Waterh.).

The build-up in population of cane grubs, which was commented on last year, again further increased in a number of areas and resulted in some heavy damage to cane crops. In a few areas the position remained more or less static, whilst in some, apparently on account of the prolonged dry conditions during the last quarter of 1940, there was a welcome reduction in the intensity of infestation. In no case, however, was there any decimation of the populations; in most areas the position in respect of the coming year is potentially dangerous, and widespread damage must be expected if the pest is favoured by suitable weather conditions during the critical stages.

Grub damage in the far north was offset to some extent by the prolonged wet season and the early commencement of crushing operations, both of which factors enabled growers to harvest grubby cane before any serious deterioration had occurred.

In the Mackay and Lower Burdekin (mainly Kalamia Mill area) districts greyback damage was the heaviest and most widespread for some years; in many cases individual farms recorded their first experience of grub damage. At Mackay the single general flight occurred in January, and early surveys indicated that only moderate infestations might be expected in areas normally suffering grub damage. However, the continuously wet autumn, followed by an exceptionally dry winter, has seriously aggravated the position, and the shallow-rooted crops are suffering marked damage from low beetle populations. While no spectacular increase in damage occurred in "normal" grub areas, a marked increase was observable in the Palms-Wallingford-Walkerston district. The main beetle flight took place in the Lower Burdekin after the heavy rains in early January, but there were some earlier flights from irrigated fields; in many cases infestations were high, while heavy wind-damaged crops interfered with fumigation.

Whilst many growers fumigated with marked success, those who had made no provision for fumigation suffered serious damage for, instead of being able to fumigate during the short period of favourable weather which occurred in January and February, much time was spent in obtaining stocks of material; this forced them to commence a late campaign that could not be completed owing to the continual wet weather experienced from February onward. In many other cases fumigation was necessarily delayed on account of the unfavourable distribution of grubs in the interspaces, and their slow and irregular approach to the stools, and continued wet weather. This irregular distribution of grubs was very marked and many observations were made of third-stage grubs devouring roots beneath the stool while others were still in the centre of the interspaces. Some growers, who hitherto have not carried or ordered adequate stocks, and who have made it a practice to rely on the fact that it is generally possible to procure supplies of fumigant from other growers whose infestations have been less than expected, were entirely unable to obtain the necessary fumigant this year. This was due partly to the extension of grub damage, and partly to short deliveries of carbon disulphide occasioned by restricted war-time shipping facilities.

In the mill areas north of Townsville a total of 1,570 acres was fumigated and, where grubs had concentrated under the stool early in the season, the operation was entirely successful; owing to wet weather some fumigation was delayed until May and naturally the crop save was correspondingly reduced. Pests Board Supervisors report that an additional area of 2,400 acres was sufficiently heavily infested to warrant fumigation, but this was not carried out owing to lack of fumigant, the prolonged wet season, or other causes. Organised fumigation is a recent innovation in the Mackay and Lower Burdekin areas: Approximately 1,000 acres were surveyed on 56 Mackay farms and 368½ acres were eventually fumigated; of this area 270 acres could be considered as first-class work, while the fumigation of the remainder, although economically sound, was adversely affected by the late start. Of the 368½ acres fumigated, no less than 151 acres were planted to S.J.2, a variety which constitutes only some 6 per cent. of the district's crop. S.J.2 also constituted a large proportion of the damaged unfumigated cane. Sustained warnings have been issued regarding the planting of this variety in possible grub areas since it is unable to withstand even light infestations of grubs. But in spite of these warnings the plantings of this very sweet variety are being rapidly extended and costly experience will continue to be bought. Grub control in the Mackay district is intimately bound up with the varietal question, and it is unfortunate that a season of widespread infestation should coincide with a period of transition when, due to the ravages of downy-mildew disease, strong rooting varieties have had to be discarded. One of the obvious remedies is a concentrated all-in effort on the part of local growers to eradicate downy mildew.

The Kalamia (Lower Burdekin) Pests Board surveyed 1,232 acres on 37 farms and ultimately fumigated 214 acres on 14 farms. Most of this work was carried out under very difficult conditions, following mixed flights, and the results must therefore be adjudged satisfactory; many surveyed blocks showing lighter infestations, which were not fumigated owing to shortage of fumigant, later suffered damage.

The desirability of having sufficient equipment to fumigate large areas in a short time is not sufficiently appreciated and again, in 1941, there was only a limited period of favourable weather when the maximum effect from fumigation was obtainable. The farmer who is able to fumigate his whole grub-infested area during a comparatively short period of maximum effect is far more happily situated than the one who has only one or two injectors, and who has in consequence to spend weeks on his fumigation campaign.

With the exception of the Lower Burdekin district, the Blundell injector has now almost entirely replaced the older makes of injector, and its superiority, both as to speed and ease of manipulation, has been maintained. An illustrated description of this machine, which included a list of spare parts and a digest of some of the minor troubles to be expected, was prepared for the Conference of Pests Boards this year, and also published in the Quarterly Bulletin.

In order to try and effect a reduction in the amount of carbon disulphide used, both from the point of view of cost and transport, a number of organic diluents of varying volatility were tested in field trials; the experiments with benzol, initiated last year, were also further extended. The diluents included six "X" solvents supplied by courtesy of the Shell Co., vegetable and mineral turpentine, benzol, and shellkol; sinapis oil and chloropicrin were also tested with a view to determining whether they would increase the toxicity of carbon disulphide. Unfortunately, none of the diluents tried

in admixture with carbon disulphide gave results significantly better than the kill recorded with an amount of carbon disulphide equal to that contained in the mixture. Therefore none of the diluents, including benzol, can be recommended for use in field practice for the dilution of carbon disulphide. However, as a direct result of these experiments, the fact was established that in many instances with suitable soil conditions (particularly high soil temperatures) it is frequently possible to fumigate effectively with less than the standard dose of 4·5 ml. of carbon disulphide. In one particular trial, 2·25 ml. was equally as effective as the full 4·5 ml. dose, indicating that under the conditions operating at the time of injection in that soil type, 4·5 ml. was an unnecessarily large dose to use.

Not infrequently growers give an extra large dosage of fumigant to ensure a high percentage kill of grubs. If this dosage be more than sufficient to do the job, not only does this practice considerably raise the cost of fumigation but also it is obviously decidedly wasteful at a time, such as the present, when supplies of fumigant are difficult to obtain. The effect on the plant itself cannot lightly be ignored, and it should be borne in mind that the maximum economic result is obtained from the minimum amount of fumigant necessary to destroy a sufficient proportion of the cane grubs.

Two large-scale beetle-feeding tree destruction schemes, one on the Burdekin River delta, and one at Cowley in the Mourilyan area, were undertaken during the year. The two schemes are not entirely similar. The former, concentrating on the destruction of all known feeding trees of the beetle, aims at the elimination of the pest from the vicinity of the cane areas. This differs from previous methods of wholesale destruction of timber, and provided that the beetles do not feed on trees that were formerly not relished by them (which is unlikely) the scheme has a distinct possibility of becoming a success. In the Cowley scheme, the systematic destruction of all timber is being carried out on certain properties in an endeavour to eliminate some of the present infestation centres. The elimination of "island areas" of feeding trees is likely to have a beneficial effect, and in general a reduction in infestation might be expected, but whether the proposed boundaries, to which clearing is being extended, are likely to prove sufficient to prevent infestation in all parts of the "benefited" area is still a moot question. The progress of these schemes will be watched with interest.

The use of Pests Board funds for payment for beetles is now prohibited, but payment for grubs is permitted since third-stage grubs will often damage young autumn plant cane. During the year the Mackay Pests Board paid £266 15s. 4d. for 4,888 lb. of grubs; it is also reported that some 2,000 lb. of beetles were taken by interested farmers—mainly in the Calen district.

### The "Frenchi" Cane Beetle (*Lepidiota frenchi*, Blackb.).

A great deal of damage was caused by Frenchi grubs in North Queensland during the past season, and in at least some instances, where damage was most severe, it was caused in land which had been ploughed out and replanted. Ploughing out and replanting is a pernicious practice in localities where Frenchi grub populations are high, because this ploughing operation is necessarily done in the early spring when the grubs are deep down in the soil and out of reach of the plough. They come up to higher soil levels to feed in October and then destroy the roots of the newly-planted cane; thus may be seen the weakness of any planting system which ignores the value of ploughing during the summer period, when these grubs are particularly susceptible to destruction. A policy of ploughing out and replanting will soon run the farmer into a vicious cycle from which there is no escape except by the well-tried system of adequate fallowing.

It is a common observation that many farmers in bad Frenchi areas have numbers of Moreton Bay ash and guava trees bordering their headlands. These trees are favourite feeding trees of the Frenchi beetle, and can serve only to maintain the pest in that particular area. Of course, where a farm is in close proximity to extensive forest land, it is unlikely that any result would be achieved by felling a few trees along the headlands, but where Moreton Bay ash or guava trees along headland or roadside are the only feeding trees in the vicinity, it is believed that some relief from damage might result from the destruction of these trees. Those on the roadside in the neighbourhood of the Meringa Sugar Experiment Station were destroyed prior to last year's flight of the pest.

It is interesting to note that in some instances large numbers of Frenchi beetles have been found in the stomach of the giant toad; as many as 22 beetles were obtained from one individual. This beetle is, of course, more accessible to the toad than the greyback beetle, since it returns to the ground each morning and re-emerges each evening during flighting periods.

In the Mackay district only a few small infestations of Frenchi grubs were recorded.

### The Beetle Borer (*Rhabdocnemis obscura* Boisd.).

A prolonged wet season is usually expected to be accompanied by serious borer damage; on account of the succulence of the growth, lodging of the cane, and clinging trash, borers usually do find conditions most favourable for their increase during years of heavy rainfall. However, despite the fact that the number of wet days from January onwards was extraordinarily high, borer damage did not assume the serious proportions that might have been expected in the circumstances. This may be due in part to the lateness of growth, and to lateness in the onset of top rot disease, but in many cases it appears to be increasingly evident that the giant toad is contributing in no small way to the control of this pest. Many growers in districts where borers are usually plentiful testify to the fact that they are able to find sugar cane weevils in the stomachs of toads of even small to medium size.

### The Rat Pest.

During the past year rats continued at the level of only a minor cane pest; their incidence was again low and few fields showed evidence of significant damage.

Investigational work over the past five years has indicated that the nucleus of the periodic rat "plagues" of Queensland sugar-cane districts consists of a number of small colonies scattered here and there throughout the cane areas. That is to say heavy rat populations in canefields are caused by the building up of existing and ever-present populations rather than by migration; in normal circumstances these small colonies are often unnoticed. In the Mackay district last year an unusual August rainfall disturbed these small rat colonies throughout a wide area; the subsequent attacks on cane, however, were of little economic importance and were not sustained. No extensive breeding was noticed in the field last spring.

In the laboratory a detailed study of the suitability of red squills for use as a rat poison in Queensland canefields was undertaken. It was subsequently concluded that this material would not be a suitable substitute for either thallous sulphate or phosphorus.

### Wireworms (*Lacon variabilis* Cand.).

In the spring of 1940 many poor strikes of cane plants were experienced in the Mackay district. As in the previous year, unfavourable soil and climatic conditions coupled with the varietal factor were chiefly responsible. Unfavourable summer and autumn weather followed. In many fields the presence of wireworms was a potential source of danger, but in most instances trouble from these pests was automatically avoided by the generally late planting imposed by weather conditions throughout the district. A few badly infested fields were recorded, but wireworms could not be accounted responsible for the low crop yields recorded in much of the normal wireworm country.

### White Sugar Cane Scale (*Aulacaspis madiunensis* Zehnt.).

This scale, as has been pointed out previously, may be most damaging to standover cane, and the results of the varietal resistance trial set out in 1939 became apparent during the season 1940-41. The variety Comus appears to be highly resistant, whilst the only (very small) colonies of the scale found on the varieties Q.23 and Q.25 were found where infective material had been scattered adjacent to individual stools of these varieties. Jason, the other variety under test against the standard P.O.J.213, bore a very small number of well-developed insects scattered throughout the plot, whilst on P.O.J.213 the scale insects had spread well throughout the plot.

### Non-Approved Varieties.

The conclusion of the 1940 crushing season and subsequent ploughing out of fields saw the elimination of at least any material stands of non-approved varieties. Rather than destroy grown crops during a war period it was decided at the commencement of the season, that a grower with cane of a non-approved variety might harvest it and deliver it to a mill provided the proceeds of the crop were paid to an approved Patriotic Fund. Under this scheme various Patriotic Funds benefitted from the sale of some 2,257 tons of cane of non-approved varieties.

The main difficulties in the way of the elimination of non-approved varieties were encountered at Mulgrave, where no Cane Prices Board Award operated until recently, and in certain mill areas in Mackay where it has been the practice to grow an extensive list of miscellaneous varieties. Some sixty-two orders to plough out or dig out stools of non-approved varieties have been issued since the completion of the 1940 harvest; as stated above one grower was prosecuted for non-compliance with such an order, while another prosecution is pending.

### Gumming Disease (*Bacterium Vasculorum* (Cobb) Greig-Smith).

During the year gumming disease was observed in the Moreton, Mulgrave, and Hambledon mill areas. At Moreton the disease was confined to the sole susceptible variety, H.Q.285, and since this cane has now been removed from the approved list, it is expected that the disease will soon be virtually eliminated.

Some ten new infested farms were recorded in the Mulgrave area, but the general situation has very considerably improved, due to the rapid elimination of the variety S.J.4, of which only a few acres will remain after the conclusion of the 1941 season. Some 300 acres of diseased cane were ploughed out in 1940 and a further 200 acres will be ploughed out this season, leaving only about 60 acres now suspected to be infested. As must be expected, the situation in the Hambledon area has deteriorated with the further spread of the disease in S.J.4, and no marked improvement is possible until this variety is eliminated. A considerable amount of Pompey is also grown in this mill area, and its definite susceptibility to gumming disease makes its retention as an approved variety doubtful.

A resistance trial, conducted in the Pathology Plot, was concluded on 8th October with the following results in the named varieties:—

| Variety. | Dead Stalks. | Living Stalks Oozing Gum. |
|---|---|---|
| | Per cent. | Per cent. |
| H.Q.426 | 60 | 50 |
| 1900 Seedling | 10 | 30 |
| D.1135 | 0 | 15 |
| Q.28 | 0 | 0 |
| Q.29 | 0 | 4 |
| Q.44 | 0 | 2 |
| 28-4291 | 0 | 0 |
| 31-2484 | 0 | 0 |
| 32-8560 | 0 | 0 |
| Improved Fodder | 0 | 0 |
| China | 0 | 0 |
| H.Q.458 | 10 | 20 |
| Pompey | 20 | 45 |

This performance of the new Queensland and Hawaiian seedlings is highly satisfactory.

The current trial will be harvested in the late spring, but interim results suggest that 31-2806, 32-1063, Cato, Hind's Special, and Uba Marot are highly resistant, while 32-3575 is definitely more susceptible than D.1135.

### Downy Mildew (*Sclerospora sacchari* T. Miy.).

Downy mildew remains the major cane disease of Queensland, and was recorded in the Cairns, Mackay, and Bundaberg districts. Due to the vigilance of Disease Control Boards the small outbreaks in the Cairns district have been kept within bounds. Eradication orders were issued to two farmers in the Mulgrave and five in the Mossman areas; only four diseased stools were found on one farm in the Hambledon Mill area.

The position is improving in the Mackay district as a combined result of the non-approval of P.O.J.2878, the issue of disease eradication orders, and the work of the Disease Control Board. Heretofore the Board has had to concentrate on holding the fort but, with the elimination of P.O.J.2878 from diseased areas, it will be free to give attention to the cleaning up of scattered centres of infection. Initial steps have been taken to repropagate Q.45 and P.O.J.2878 in the "diseased" areas in order to have supplies of these varieties available for planting as soon as the improved position warrants it. The pronounced grub resistance of P.O.J.2878 makes it a very valuable variety in grub-infested sections, and its re-establishment is much to be desired in such areas.

One hundred disease eradication orders covering 3,801 acres of cane were issued in Mackay during the year, but of this number only thirteen, covering 28 acres (issued in June, 1941) have been issued for the 1941 crop. Proceedings were instituted against five farmers for failure to carry out the terms of these orders, the offender being convicted and fined in each case. The Disease Control Board rogued 14,529 stools of diseased cane from 44,758 acres on 222 farms.

A very material improvement has been effected at Bundaberg, both as to area infected and numbers of diseased stools found. For the 1941 season 22 disease eradication orders covering 124 acres have been issued in respect of downy mildew and Fiji diseases, as against 38 orders and 367 acres for the 1940 season; at the same time the area under P.O.J.2878 has still further increased.

Further laboratory investigation of downy mildew carried out may be summarised as follows:—

Exposed setts of freshly stripped *Erianthus arundinaceum* (Retz.) Jesw. did not become infected on exposure to a heavy source of infection. Plantings of maize were made contiguous to a source of infection on 3rd October and 7th November, on which latter date conidial production was occurring nightly. All plants of No. 2 planting were diseased, stunted, and malformed within a month, while no plant of No. 1 planting developed symptoms until 5th December, the plants then being about 4 feet 6 inches high; subsequently two-fifths of these plants became diseased, but there was little malformation, while grain production was normal, in contrast to the later-planted plot which produced no grain at all. Further attempts to transmit downy mildew of maize through the seeds were unsuccessful. Similarly experimental efforts at direct infection of young cane leaves by enclosing in tubes with diseased leaves, *in situ*, were unsuccessful.

A recording thermometer was installed in the Pathology Plot and operated over the three months period, September-November. Up to 15th October minima ranged from 48.2°F. to 64°F., but on only five occasions did the minimum temperature exceed 60°F., while the midnight temperature exceeded 60 on 14 occasions. Sporulation was first observed on the morning of 16th October, the midnight temperature of the previous night having been 64°F. Thereafter minima were always above 60°F., with highest minimum of 68°F.; sporulation was slightly irregular immediately after 15th October, but soon became copious and heavy. These observations support laboratory observations that the minimum temperature for sporulation is about 60°F. Oospores exposed in trash or soil, or treated with germination stimulants failed to germinate.

Further investigation of the effects of warm water treatment resulted in the production of healthy plants from diseased setts treated at 54°C. and 56°C. for 20 and 10 minutes respectively, although germination after treatment was only fair. Treatment for 10 minutes at 54°C. appears to be just on the border line of effective treatment.

Routine resistance trials with named varieties and advanced seedlings were carried out at Cairns and Bundaberg, the summarised results being set out below. Previously, reports of resistance trials have recorded the number of diseased *stools*, but observation has convinced us that in trials which are concluded at eight months old the unit of infection is the *stalk;* consequently, results are now recorded on the stalk basis. Infection was generally light in the Cairns trial, but it would appear that Q.20, Q.36, Q.39, Q.813 (standard), Atlas, Cato, Comus, Venus, S.C.12/4, E.K.28, Kassoer, *S. spontaneum* Tank., *S. spontaneum* Burma, and *Erianthus arundinaceum* are fairly resistant. On the other hand, the seedling Neptune showed a very high degree of susceptibility.

Infection recorded in the Bundaberg trial was as follows (G., H., and I. being seedlings under trial at Bundaberg or Mackay):—

No infection.—28-4291, 31-2484, 32-8560, B.726, Co.281, P.O.J.2725, Q.28, Q.43, Q.45, G.10, G.48 (Mackay), H.18 (Mackay), China, and Improved Fodder (Meringa).

0-10 per cent.—B.2935, Co.290, Glagah, Q.813, 30R.115, 30G.1250, 29G.706, G.34, H.16, I.6, I.9, I.11, I.15, I.27, I.31, I.35, I.41, H.15 (Mackay), H.63 (Mackay).

10-20 per cent.—P.O.J.2878, Q.25, 30S.N.362.

20-40 per cent.—Marcus, P.O.J.213, 31-1389, G.16, I.38, I.39.

40-60 per cent.—32G.1374, 33S.N.1270, I.25, I.46, I.62.

Over 60 per cent.—Co.364, I.64.

Of the above results, Q.25 (14 per cent.) is higher than was expected from the past performance of this cane. It will be noted that the susceptibility of the Hawaiian seedling 31-1389 is confirmed while the other three newer importations appear quite resistant. The apparent high resistance of Glagah (3 infected shoots in a total of 537) indicates that the susceptibility of P.O.J.2878 and other high numbered P.O.J. canes does not come from *S. spontaneum*. This is supported by the behaviour of the two *spontaneum* canes in the Cairns trial (see above).

### Leaf Scald (*Bacterium albilineans* Ashby).

Leaf-scald continues to be of economic importance only in the very wet area between Gordonvale and Babinda. Varieties in a routine resistance trial conducted in this area again became infected to a suitable degree after preplanting inoculation of setts with mixed juice expressed from diseased canes.

The evaluation of results from resistance trials carried out with this disease has always presented a problem, and it long ago became evident that something more than the mere percentage of stools infected was necessary in order to interpret results. For some years past, therefore, trials have been inspected at fixed intervals and the freshly diseased stools marked with a distinguishing peg; it was therefore possible later to tell at a glance when symptoms had become apparent. At the final examination a note is taken of the diseased stools which have made an apparent recovery; in this way it is possible to form an estimate of the "tolerance" of each variety, and field observations suggest that varietal tolerance or sensitivity are important factors in field behaviour. For example: Inoculation of S.J.4 results in the early development of a high percentage of infection, but, with the incidence of adverse weather conditions, diseased plants die, leaving the field healthy, and resulting in subsequent freedom of disease of plantings made from such a field. Oramboo, on the other hand, is not particularly easily infected, but diseased stools tolerate the disease and persist, thereby providing continuous sources for the gradual infection of the whole field.

The results with named varieties included in the trial are set out below, a noting as to apparent tolerance of appreciably infected varieties being included:—

| Variety. | Per cent. Stools Infected. | Appearance of Symptoms. | Tolerance. |
|---|---|---|---|
| Atlas .. | 3 | .. | .. |
| Badila .. | 39 | Early to Mid-season .. .. | Tolerant |
| B.726 .. | 39 | Continuously .. .. .. | Tolerant |
| B.2935 .. | 4 | .. | .. |
| C.P.29/116 | 0 | .. | .. |
| C.P.807 .. | 0 | .. | .. |
| Cato .. | 24 | Early to Mid-season .. .. | Recovers |
| Comus .. | 6 | Early .. .. .. .. | .. |
| D.1135 .. | 0 | .. | .. |
| H.Q.409 .. | 31 | Early to Mid-season .. .. | Recovers |
| H.Q.426 .. | 78 | Early to Mid-season .. .. | Fairly Tolerant |
| Korpi .. | 50 | Early to Mid-season .. .. | Recovers |
| Marcus .. | 13 | Early to Mid-season .. .. | .. |
| Oramboo .. | 33 | Continuously .. .. .. | Tolerant |
| Q.20 .. | 23 | Early to Mid-season .. .. | .. |
| Q.25 .. | 3 | .. | .. |
| 31-1389 .. | 14 | Late .. .. .. .. | .. |

Of the above varieties, under field conditions H.Q.426, which is both susceptible and tolerant, is quite the most adversely affected by leaf-scald.

### Fiji Disease.

As in the case of downy mildew (*see* page 21) the Fiji disease position improved generally in the Bundaberg district, while infection was maintained at the previous low level at Isis. The application of strict variety control and the systematic inspectional programme of the Maryborough Cane Disease Control Board have helped to reduce infection in the Maryborough district, and a partial return to the cultivation of susceptible varieties should soon be practicable; likewise, the improved position in the Logan district has permitted the approval of P.O.J.2878 for planting.

In the Moreton area progress has been retarded by the high proportion of the susceptible P.O.J.2878 in the river areas and the large amount of standover cane. The Disease Control Board strictly adhered to the policy of supplying only known disease-free plants for the diseased areas, and this should be reflected in an improved position for 1942. Fifty-nine disease eradication orders, covering 185 acres, were issued for completion in the 1941 season as compared with 70 orders on 241 acres for the 1940 season.

The ratoons of the resistance trial just completed experienced unfavourable growing conditions, and infection was too light to permit of specific conclusions being drawn. Q.25 again proved susceptible, even more so than P.O.J.2878, while, on the other end of the scale, Q.27 appears to be quite resistant. The delay in obtaining results from field trials is a very definite handicap and prompted the carrying out of a small trial in the Pathology Plot. Seventy-five setts of each of three varieties were planted in three plots of 25 setts each, each sett occupying 1 square foot of ground. When plants were some 2 feet high the whole was covered with a cloth cage and infective hoppers from a caged diseased plant released therein. After some 10 days feeding the hoppers were asphyxiated and the cage removed. Symptoms commenced to appear within a few weeks, and it would seem that such a system of mass planting and artificial inoculation might be used for quick results. During the current season it is proposed to germinate single-eye setts in galvanised iron pots and liberate young hoppers in a large cage while the plants are still young, afterwards mass planting them in the field for observation.

### Miscellaneous Diseases.

*Chlorotic Streak.*—In last year's report we recorded the recovery of setts after treatment for 20 minutes at the low temperature of 44°C., while it was also reported that measurements of internal temperatures of growing cane stalks approximated this temperature when they were exposed to the sun. It was accordingly thought that herein might be found the explanation of much of the undoubted field recovery from chlorotic streak. In an experiment conducted last summer setts of Badila were placed on a sheet of galvanised iron and exposed to direct sunlight for a period of six hours. The maximum screen temperature recorded during the day was 34·8°C., while a stiff wind blew almost continuously. The maximum internal sett temperature recorded was 47°C., but ranged from 43°C. to 47°C. for different setts, with a mode of 45. After treatment the setts, together with adequate controls, were soaked overnight and planted. To date (six months after planting) symptoms have been observed in 90 per cent. of the stools resulting from the control setts as compared with 20 per cent. in the treated; the latter also look considerably more vigorous. It is obvious therefore that under the conditions of the experiment the exposure to sun has "cured" the disease. During the spring it is planned to set out such a trial on a field scale and under field conditions.

*Unknown Disease (Sclerospora sp. ?).*—While visiting the Richmond River (New South Wales) area in early spring, the writer's attention was directed by Mr. D. S. North to a stunted stool of cane, which on macroscopic examination closely resembled dwarf disease. The stool was growing in a nine-months old field of seedlings under wet, low lying, but reasonably well-drained conditions. An examination of the ratoons from which plants had been obtained showed no symptoms of any such disease. Planting material was brought to Brisbane and planted in the Pathology Plot, but here, in the absence of the competition of neighbouring well-grown stools, the macroscopic symptoms did not so closely resemble dwarf disease: microscopic appearance was quite dissimilar.

Characteristic features of the material grown in Brisbane were a stunting of the whole plant, drying and splitting of leaf margins and premature death of leaves, with a marked mottling of the bases of the younger leaves; during the active growth period leaves drooped markedly (resembling leaves of the maize plant) but with the advent of winter the leaves became stiff and upright, and the general appearance again became suggestive of dwarf disease. Sections of leaves revealed the presence of numerous spherical bodies resembling the oospores of *Sclerospora sacchari* T. Miy.

It is of interest to note that, in April-May, 1941, the same disease was observed in a few stools of P.O.J.2878 growing in a wet field in North Bundaberg.

*Mosaic.*—Following the droughty conditions of the spring of 1940 the sugar belt as a whole experienced a long and intense wet season during which normal weed eradication was not practicable. As a result of this combination of circumstances large populations of *Aphis maidis* built up and spread of mosaic was more rapid than usual, especially in the Bundaberg district. Here the susceptible Q.25 became infected to some degree, but it is expected that with a return to normal conditions, the position will right itself. It would appear, however, that Q.25 is too susceptible to be grown on much of the river bank country.

*Minor Diseases.*—Sooty mould was very prevalent after the build-up of aphis populations during the very dry spring. Eye spot was observed in P.O.J.2878 in various parts of Southern Queensland for the first time for many years; this was doubtless related to the cool wet conditions experienced in autumn and early winter. Red stripe was less prevalent than usual, while brown stripe was somewhat more noticeable. Pineapple disease was found to be responsible for germination failure in a number of instances.

### Miscellaneous.

*Quarantine House.*—In spite of all reasonable precautions aphids appear in the quarantine house at intervals, and thereafter thrive under the influence of the warm humid conditions, necessitating constant spraying for rather unsatisfactory control. In order to check the growth of this pest sodium selenate was applied to the soil, seven weeks after planting, at a rate equivalent to five parts of selenium per million parts of soil. This treatment satisfactorily controlled the aphids—although not eradicating them—but was excessive from the standpoint of maximum growth rate; certain varieties temporarily developed spots and stripes on the leaves and necrosis in the region of the point of attachment of leaf sheaths, while growth rates slowed down.

*Soil Investigations.*—Quarterly determinatoins of numbers of bacteria, fungi and actinomycetes have been made on soil samples obtained from the long range rotation trial on the Bundaberg Station. Up to the present no definite trends have been observed in the various treatments.

*Germination Studies.*—It is believed that the economic losses due to poor germination considerably outweigh those due to the incidence of disease and a study of this problem has recently been undertaken. After reasonable care has been taken in the selection of sound planting material the planted cutting is still exposed to the attack of certain soil-inhabiting fungi, the likelihood of such attack being more or less inversely proportional to the rate of germination. The problem confronting us would, therefore, appear to be, (*a*) *stimulation* of rate of germination in order to escape attack, or (*b*) *protection* of the sett from attack when, by virtue of unfavourable environmental conditions, the period of dormancy is prolonged. The problem is being approached along these lines, and, at the present stage of investigations, it would appear that protection is more important than stimulation.

### Introduction of Varieties.

The following varieties were introduced into the State during the period under review:—

D.166/34 (P.O.J.2878 x Sorghum) ex British Guiana.

C.P.38-907 (P.O.J.2725 x *S. spontaneum* (Amu Darya 60)) ex U.S.A.

C.P.38-782 (P.O.J.2725 x *S. spontaneum* (Amu Darya 59)) ex U.S.A.

C.P.38-778 (P.O.J.2725 x *S. spontaneum* (Amu Darya 59)) ex U.S.A.

C.P.39-339 (E.P.C.155 (P.O.J.2725 x *S. spontaneum*) x P.O.J.2878) ex U.S.A.

C.P.39-424 (P.O.J.2725 x E.P.C.573 (P.O.J.2725 x *S. spontaneum*)) ex U.S.A.

Vesta (P.O.J.2878 x 31 M.Q.228) ex Colonial Sugar Refining Co., Sydney.

Akbar (Co.270 x 27 M.Q.1122) ex Coloniel Sugar Refining Co., Sydney.

33 S.N.1166 (P.O.J.2878 x 31 M.Q.228) ex Colonial Sugar Refining Co., Sydney.

The variety D.166/34 has performed well in comparison with the standard Diamond 10 in British Guiana; its appearance in the quarantine house is that of a pure sugar-cane. The Canal Point seedlings represent the progeny of the first and second nobilizations of the Turkestan *S. spontaneum* and will be used for back-crossing on to noble parents in the hope of developing frost resistant canes; it will be recalled that the original Turkestan cane maintained a normal green leaf in the midst of snow. The varieties Vesta, Akbar, and 33 S.N.1166 are seedlings of commercial promise which were propagated and tested in the Northern Rivers district of New South Wales.

## DIVISION OF MILL TECHNOLOGY.

Mr. E. R. Behne, Mill Technologist.

### Staff.

Mr. G. H. Jenkins, Assistant Mill Technologist, has tendered his resignation after nearly four years' service with the Bureau. His departure will leave a serious gap in the ranks of the technology staff.

### Mutual Control.

The Ninth Annual Synopsis of Mill Data for Mills in the Mutual Control, incorporating twenty-four mills as previously, has been published. The figures presented are for the 1940 season.

### Standardisation of Apparatus.

The following is a record of the work of testing and standardisation carried out during the year:—

*Brix Spindles*—223 spindles were tested, and only three of these had errors beyond the legal tolerance.

*Polariscopes*—One instrument was completely dismantled and reconditioned.

*Polariscope Tubes*—One tube was tested, and found correct.

*Pipettes*—Six pipettes were tested, and found satisfactory.

*Burettes*—Twelve burettes were tested, and found satisfactory.

*Cylinders*—Six cylinders were tested, and found satisfactory.

*Flasks*—Twelve flasks were tested. Five of these had errors beyond the tolerance allowed.

*Thermometers*—Four thermometers were standardised.

*Weights*—Two boxes of weights were tested, and adjusted where necessary.

The total number of pieces tested was considerably below that of the previous year, but this was only to be expected following the abnormally high purchases of apparatus by mills during the 1939-1940 financial year.

### Technical Papers.

At the Twelfth Annual Conference of the Queensland Society of Sugar Cane Technologists, four papers were presented by members of the Technology Division, as follows:—

Behne, E. R., "Notes on Mill Settings."

Jenkins, G. H., "Mechanical Circulation in Vacuum Pans."

Praeger, A. H., "Mud Treatment."

Clayton, J. L., "Juice Level Control in Evaporators."

### Technical Communications.

Since the previous report, eight Technical Communications have been issued by the Bureau, and six of these were prepared by the Technology Division. The Technical Communications, 1940, No. 5 and No. 6, present the results of slack seasonal investigations carried out at the Bureau by Mr. J. H. Webster, of Racecourse Mill, and Mr. E. D. Jensen, of Fairymead Mill, during 1940. The list of Technical Communications is as follows:—

1940.—No. 4—"Furnace Investigations, 1939 Season," by G. H. Jenkins.

No. 5—"The Hygroscopicity of Raw Sugar," by J. H. Webster.

No. 6—"The Conductometric Determination of Ash," by E. D. Jensen.

No. 7—"Tests on the Dorr Clarifier," by G. H. Jenkins.

No. 9—"Glossary of Terms used in Queensland Cane Sugar Factories."

1941.—No. 1—"Cane Preparation. Part II. The National Shredder (continued), High Speed Knives and the Searby Shredder," by E. R. Behne.

### News Letter.

Seven issues of the News Letter have now been distributed, and the paper is proving most useful as a means of maintaining close contact between the Bureau and the Queensland Sugar Mills. The News Letter has been received very favourably by mill executives, and a vote of appreciation was carried at the 1941 meeting of the Mill Research Programme Committee.

### Seasonal Investigations, 1940.

The Sixth Annual Meeting of the Mill Research Programme Committee was held at Cairns on 21st April, 1941. Mr. H. G. Brandon was elected chairman, and Mr. W. Harrison, secretary. The following programme of investigations for the 1941 season was adopted:—

(1) *Maceration Tests.*

An investigation into the factors which influence the efficiency of maceration, e.g., temperature, point of application, recirculation of mill juices, &c.

(2) *Pan Performance.*

An investigation into the operation of pans with mechanical circulation with a view to determining the conditions which contribute to the formation of false grain, as is frequently reported.

(3) *Comparison of Sludge Filtration and Settling.*

Tests to be conducted with experimental equipment to evaluate the reported superiority of sludge filtration over settling.

(4) *Conditioning of Raw Sugar.*

Tests to determine the possibility of conditioning raw sugar at the bagging station to reduce the tendency towards subsequent caking.

(5) *Corrosion and Erosion.*

The compilation of records of the useful life at different mills of the more important working parts subject to excessive wear or corrosion.

(6) *Mill Visits.*

(7) *Incidental Work, Unforeseen Work, and the Checking of Previous Advices.*

### Colorimetric pH Standards.

As in 1940, standard phenol red colour tubes were forwarded to mills on request.

### Mill Work—1940 Season.

Wind and flood damage in the far Northern and Burdekin cane areas contributed largely to a reduction in the total tonnage of cane crushed during 1940. Southern mills crushed a slightly smaller quantity of cane than in the previous year, but the yield of sugar was the highest on record for this district.

Crushing rates were generally higher than before, and at the same time the figures for extraction and lost cane juice per cent. fibre showed improvement.

In regard to factory performance the standard was well maintained, although the figures show a drop in coefficient of work as compared with the previous year. Over the past decade there has been a general overall improvement in mill figures, but minor fluctuations can be noted from year to year. These must not necessarily be interpreted as direct indications of varying efficiency of sugar recovery, but reflect, in part at least, deficiencies of the c.c.s. formula in assessing the quality of the material entering the factory.

| — | Season. | Pol in Cane. | Fibre in Cane. | Purity, 1st Expd. Juice. |
|---|---|---|---|---|
| | | Per cent. | Per cent. | Per cent. |
| Southern District | 1931 | 15·01 | 15·40 | 88·25 |
| | 1932 | 13·32 | 15·16 | 84·95 |
| | 1933 | 13·55 | 15·21 | 87·65 |
| | 1934 | 14·67 | 14·59 | 89·74 |
| | 1935 | 14·56 | 14·47 | 88·60 |
| | 1936 | 15·31 | 14·32 | 88·83 |
| | 1937 | 15·05 | 14·04 | 88·14 |
| | 1938 | 14·62 | 13·66 | 88·87 |
| | 1939 | 14·88 | 13·70 | 88·46 |
| | 1940 | 15·42 | 13·40 | 87·69 |
| Central District .. | 1931 | 16·73 | 12·42 | 89·93 |
| | 1932 | 16·22 | 11·99 | 90·02 |
| | 1933 | 15·40 | 12·25 | 90·84 |
| | 1934 | 16·45 | 12·20 | 90·82 |
| | 1935 | 16·54 | 12·36 | 90·78 |
| | 1936 | 16·43 | 11·84 | 90·91 |
| | 1937 | 16·62 | 10·96 | 90·06 |
| | 1938 | 16·70 | 11·55 | 91·58 |
| | 1939 | 16·33 | 11·39 | 90·43 |
| | 1940 | 16·34 | 11·52 | 90·54 |
| Northern District | 1931 | 15·56 | 10·61 | 89·94 |
| | 1932 | 16·01 | 10·51 | 90·11 |
| | 1933 | 14·92 | 10·27 | 88·84 |
| | 1934 | 15·16 | 10·30 | 89·08 |
| | 1935 | 15·91 | 11·35 | 89·63 |
| | 1936 | 15·01 | 9·92 | 87·92 |
| | 1937 | 16·14 | 10·12 | 89·79 |
| | 1938 | 15·74 | 10·17 | 89·95 |
| | 1939 | 16·18 | 9·84 | 90·30 |
| | 1940 | 16·26 | 9·89 | 90·45 |
| All Districts .. | 1931 | 15·94 | 12·28 | 89·59 |
| | 1932 | 15·90 | 11·51 | 89·64 |
| | 1933 | 14·85 | 12·00 | 89·40 |
| | 1934 | 15·57 | 12·23 | 89·95 |
| | 1935 | 15·84 | 12·39 | 89·83 |
| | 1936 | 15·66 | 11·63 | 89·36 |
| | 1937 | 16·15 | 11·17 | 89·61 |
| | 1938 | 15·84 | 11·63 | 90·32 |
| | 1939 | 15·88 | 11·56 | 89·85 |
| | 1940 | 16·04 | 11·58 | 89·65 |

TONS OF CANE PER TON OF 94 N.T. SUGAR.

| 1928. | 1929. | 1930. | 1931. | 1932. | 1933. | 1934. | 1935. | 1936. | 1937. | 1938. | 1939. | 1940. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7·18 | 6·91 | 6·83 | 6·94 | 6·90 | 7·31 | 6·97 | 6·92 | 6·94 | 6·73 | 6·87 | 6·77 | 6·82 |

AVERAGE CRUSHING RATES (TONS CANE PER HOUR).

| 1933. | 1934. | 1935. | 1936. | 1937. | 1938. | 1939. | 1940. |
|---|---|---|---|---|---|---|---|
| 45·88 | 48·92 | 50·80 | 54·83 | 55·73 | 60·80 | 61·53 | 61·67 |

SOUTHERN DISTRICT.

| —— | 1934. | 1935. | 1936. | 1937. | 1938. | 1939. | 1940. |
|---|---|---|---|---|---|---|---|
| Tons of cane | 817,551 | 909,223 | 794,390 | 647,220 | 1,035,992 | 1,262,554 | 1,217,278 |
| Tons of 94 n.t. sugar | 107,676 | 117,467 | 109,142 | 85,131 | 135,261 | 168,896 | 169,232 |
| Tons of cane per ton 94 n.t. sugar | 7·593 | 7·74 | 7·28 | 7·60 | 7·66 | 7·48 | 7·19 |
| Pol in cane | 14·67 | 14·56 | 15·31 | 15·05 | 14·62 | 14·88 | 15·42 |
| Fibre in cane | 14·59 | 14·47 | 14·32 | 14·04 | 13·66 | 13·70 | 13·40 |
| Purity— | | | | | | | |
| First expressed juice | 89·74 | 88·6 | 88·83 | 88·14 | 88·87 | 88·46 | 87·69 |
| Clarified juice | 88·44 | 87·78 | 87·57 | 87·23 | 88·07 | 87·80 | 86·91 |
| Syrup | 88·73 | 88·1 | 87·97 | 87·42 | 88·33 | 88·22 | 87·28 |
| Gallons molasses per ton cane | 4·02 | 4·11 | 4·36 | 4·91 | 4·13 | 4·13 | 4·56 |
| Apparent purity final molasses | 41·24 | 39·72 | 40·07 | 41·23 | 39·05 | 38·79 | 37·42 |
| Overall recovery | 85·70 | 86·08 | 85·98 | 83·83 | 85·46 | 86·17 | 86·44 |
| Recovery on mixed juice | 89·59 | 91·995 | 90·64 | 87·81 | 89·82 | 90·08 | 90·27 |
| Boiling-house efficiency | 96·12 | 96·94 | 95·41 | 92·82 | 94·55 | 95·02 | 95·63 |

CENTRAL DISTRICT.

| —— | 1934. | 1935. | 1936. | 1937. | 1938. | 1939. | 1940. |
|---|---|---|---|---|---|---|---|
| Tons of cane | 1,766,564 | 1,530,240 | 1,966,183 | 1,961,413 | 2,030,166 | 2,397,268 | 1,891,399 |
| Tons of 94 n.t. sugar | 271,437 | 233,901 | 301,893 | 304,502 | 314,574 | 371,259 | 280,777 |
| Tons of cane per ton 94 n.t. sugar | 6·508 | 6·542 | 6·51 | 6·44 | 6·45 | 6·46 | 6·74 |
| Pol in cane | 16·45 | 16·54 | 16·43 | 16·62 | 16·70 | 16·33 | 16·34 |
| Fibre in cane | 12·20 | 12·36 | 11·84 | 10·96 | 11·55 | 11·39 | 11·52 |
| Purity— | | | | | | | |
| First expressed juice | 90·82 | 90·78 | 90·91 | 90·06 | 91·58 | 90·43 | 90·54 |
| Clarified juice | 90·42 | 90·01 | 90·25 | 89·55 | 90·77 | 89·97 | 90·04 |
| Syrup | 90·41 | 90·06 | 90·54 | 89·84 | 91·04 | 90·33 | 90·14 |
| Gallons molasses per ton cane | 3·60 | 3·91 | 3·71 | 4·13 | 3·72 | 3·96 | 4·03 |
| Apparent purity final molasses | 38·91 | 39·52 | 37·22 | 35·93 | 37·85 | 35·33 | 35·40 |
| Overall recovery | 88·69 | 88·79 | 88·62 | 89·00 | 88·72 | 86·98 | 87·80 |
| Recovery on mixed juice | 93·53 | 93·79 | 93·20 | 93·25 | 92·70 | 91·20 | 92·19 |
| Boiling-house efficiency | 97·47 | 97·8 | 97·08 | 97·54 | 96·26 | 95·20 | 96·23 |

NORTHERN DISTRICT.

| —— | 1934. | 1935. | 1936. | 1937. | 1938. | 1939. | 1940. |
|---|---|---|---|---|---|---|---|
| Tons of cane | 1,685,876 | 1,780,804 | 2,410,638 | 2,524,301 | 2,275,927 | 2,378,999 | 2,072,079 |
| Tons of 94 n.t. sugar | 233,457 | 258,958 | 333,613 | 373,692 | 328,301 | 351,267 | 309,437 |
| Tons of cane per ton 94 n.t. sugar | 7·221 | 6·877 | 7·23 | 6·76 | 6·93 | 6·77 | 6·70 |
| Pol in cane | 15·16 | 15·91 | 15·01 | 16·14 | 15·74 | 16·18 | 16·26 |
| Fibre in cane | 10·30 | 11·35 | 9·92 | 10·12 | 10·17 | 9·84 | 9·89 |
| Purity— | | | | | | | |
| First expressed juice | 89·08 | 89·63 | 87·92 | 89·79 | 89·95 | 90·30 | 90·45 |
| Clarified juice | 89·68 | 89·96 | 88·59 | 90·29 | 90·07 | 90·34 | 90·63 |
| Syrup | 89·64 | 89·89 | 88·58 | 89·85 | 90·89 | 90·40 | 90·73 |
| Gallons molasses per ton cane | 3·79 | 3·86 | 3·94 | 3·51 | 3·39 | 3·56 | 3·62 |
| Apparent purity final molasses | 37·78 | 36·53 | 31·66 | 34·62 | 34·38 | 35·81 | 36·20 |
| Overall recovery | 86·80 | 87·93 | 88·10 | 88·01 | 87·50 | 86·88 | 87·67 |
| Recovery on mixed juice | 91·62 | 92·86 | 92·58 | 92·44 | 92·53 | 91·15 | 91·69 |
| Boiling-house efficiency | 96·34 | 97·34 | 97·97 | 96·80 | 96·89 | 95·25 | 95·71 |

ALL QUEENSLAND DISTRICTS.

| —— | 1934. | 1935. | 1936. | 1937. | 1938. | 1939. | 1940. |
|---|---|---|---|---|---|---|---|
| Tons of cane | 4,269,991 | 4,220,267 | 5,171,211 | 5,122,934 | 5,342,085 | 6,038,821 | 5,180,756 |
| Tons of 94 n.t. sugar | 612,570 | 610,326 | 744,648 | 763,325 | 778,136 | 891,422 | 759,446 |
| Tons of cane per ton 94 n.t. sugar | 6·970 | 6·915 | 6·94 | 6·73 | 6·87 | 6·77 | 6·82 |
| Pol in cane | 15·57 | 15·84 | 15·66 | 16·15 | 15·84 | 15·88 | 16·04 |
| Fibre in cane | 12·23 | 12·39 | 11·63 | 11·17 | 11·63 | 11·56 | 11·58 |
| Purity— | | | | | | | |
| First expressed juice | 89·95 | 89·83 | 89·36 | 89·61 | 90·32 | 89·85 | 89·65 |
| Clarified juice | 89·42 | 89·51 | 89·07 | 89·44 | 89·83 | 89·48 | 89·28 |
| Syrup | 89·48 | 89·57 | 89·27 | 89·41 | 90·29 | 89·77 | 89·46 |
| Gallons molasses per ton cane | 3·76 | 3·93 | 3·96 | 4·02 | 3·54 | 3·88 | 4·06 |
| Apparent purity final molasses | 39·20 | 38·33 | 35·54 | 36·62 | 37·08 | 36·51 | 36·39 |
| Overall recovery | 87·37 | 87·8 | 87·90 | 87·79 | 87·52 | 86·70 | 87·34 |
| Recovery on mixed juice | 92·49 | 92·98 | 92·52 | 92·20 | 92·01 | 90·94 | 91·49 |
| Boiling-house efficiency | 96·82 | 97·36 | 97·18 | 96·65 | 96·14 | 95·23 | 95·90 |
| Pol extraction | 94·46 | 94·43 | 95·01 | 95·22 | 95·12 | 95·34 | 95·46 |
| C.C.S. in cane | 14·485 | 14·79 | 14·52 | 15·00 | 14·79 | 14·77 | 14·90 |
| Coefficient of work | 98·41 | 97·78 | 99·17 | 99·13 | 98·49 | 99·88 | 98·14 |

| —— | 1932. | 1933. | 1934. | 1935. | 1936. | 1937. | 1938. | 1939. | 1940. |
|---|---|---|---|---|---|---|---|---|---|
| Crop days | 3,276 | 5,130 | 4,382 | 4,296 | 4,809 | 4,497 | 4,822 | 5,163 | 4,558 |

FIGURES FOR 1940 SEASON.

| —— | Northern. | Central. | Southern. | Totals and Averages. |
|---|---|---|---|---|
| Tons cane crushed | 2,072,079* | 1,891,399* | 1,217,278* | 5,180,756* |
| Tons sugar made (94 n.t.) | 309,437* | 280,777* | 169,232* | 759,446* |
| Net titre | 96·67 | 96·66 | 96·63 | 96·66 |
| Tons of cane per ton 94 n.t. sugar | 6·70* | 6·74* | 7·19* | 6·82* |
| C.C.S. in cane | 15·19 | 15·27 | 14·12 | 14·90 |
| Coefficient of work | 98·05 | 98·13 | 98·35 | 98·14 |
| Crushing rate | 82·08 | 65·79 | 45·31 | 61·67 |
| Lost time, per cent. | 1·86 | 5·20 | 4·54 | 4·16 |
| Fibre, per cent. cane | 9·89 | 11·52 | 13·40 | 11·58 |
| Pol, per cent. cane | 16·26 | 16·34 | 15·42 | 16·04 |
| First expressed juice— | | | | |
| Brix | 21·13 | 21·62 | 21·55 | 21·45 |
| Purity | 90·45 | 90·54 | 87·69 | 89·65 |
| Clarified juice— | | | | |
| Brix | 16·86 | 15·71 | 16·14 | 16·20 |
| Purity | 90·63 | 90·04 | 86·91 | 89·28 |
| Syrup— | | | | |
| Brix | 67·83 | 69·65 | 67·21 | 68·34 |
| Purity | 90·73 | 90·14 | 87·28 | 89·46 |
| Last expressed juice— | | | | |
| Purity | 78·43 | 79·75 | 76·19 | 78·26 |
| Clarified juice per 100 cane | 100·94 | 109·45 | 104·62 | 105·23 |
| Dilution, per cent. first expressed juice | 25·33 | 37·62 | 33·52 | 32·41 |
| Final bagasse— | | | | |
| Pol | 3·31 | 3·04 | 2·37 | 2·92 |
| Dry substance | 50·17 | 48·87 | 51·64 | 50·12 |
| Pol extraction | 95·62 | 95·24 | 95·76 | 95·46 |
| Lost cane juice per cent. fibre | 43·45 | 39·13 | 29·74 | 37·48 |
| Final molasses— | | | | |
| Gallons per ton cane | 3·62 | 4·03 | 4·56 | 4·06 |
| Brix | 84·07 | 88·58 | 90·75 | 87·99 |
| Apparent purity | 36·20 | 35·40 | 37·42 | 36·39 |
| True purity | 48·88 | 46·04 | 46·05 | 47·00 |
| Reducing sugars | 14·30 | 15·55 | 13·05 | 14·29 |
| Final mud— | | | | |
| Tons per 100 tons cane | 3·34 | 3·55 | 3·36 | 3·42 |
| Pol | 3·72 | 2·36 | 2·80 | 2·93 |
| Sugar— | | | | |
| Pol | 98·401 | 98·445 | 98·529 | 98·455 |
| Reducing sugars | ·372 | ·360 | ·259 | ·335 |
| Ash | ·271 | ·285 | ·329 | ·293 |
| Mositure | ·414 | ·378 | ·343 | ·379 |
| Dilution indicator | 34·937 | 32·116 | 30·408 | 32·504 |
| Pol balance— | | | | |
| Sugar (recovery) | 87·67 | 87·80 | 86·44 | 87·34 |
| Bagasse | 4·38 | 4·76 | 4·24 | 4·54 |
| Molasses | 4·36 | 5·07 | 6·66 | 5·30 |
| Mud | 0·76 | 0·51 | 0·61 | 0·63 |
| Undetermined | 2·83 | 1·86 | 2·05 | 2·19 |
| Boiling house efficiency | 95·71 | 96·23 | 95·63 | 95·90 |
| Fuel— | | | | |
| B.T.U's. 1,000s. per ton cane— | | | | |
| Wood | 96·11 | 79·16 | 130·47 | 99·56 |
| Coal | .. | 12·23 | 5·76 | 6·46 |
| Molasses | 75·81 | 17·44 | 0·24 | 30·89 |
| Bagasse | 1,983·12 | 2,295·28 | 2,618·87 | 2,297·83 |
| Total | 2,155·04 | 2,404·11 | 2,755·34 | 2,434·74 |
| Crop days | 1,450* | 1,652* | 1,456* | 4,558* |

* All Mills. Remainder except C.S.R., Pioneer, and Inkerman Mills.

CANE MILLED AND SUGAR YIELDS, SEASON 1940.

| Mill. | Tons Cane Crushed. | Tons 94 n.t. Sugar Made. | Tons Cane per Ton 94 n.t. Sugar. | |
|---|---|---|---|---|
| | | | 1940. | 1939. |
| Mossman | 130,086 | 20,043 | 6·490 | 6·713 |
| Hambledon | 226,763 | 34,332 | 6·605 | 6·721 |
| Mulgrave | 247,584 | 37,211 | 6·654 | 6·778 |
| Babinda | 218,773 | 30,820 | 7·098 | 7·183 |
| Goondi | 185,145 | 26,625 | 6·954 | 6·985 |
| South Johnstone | 230,237 | 34,152 | 6·742 | 6·888 |
| Mourilyan | 183,123 | 27,144 | 6·746 | 6·644 |
| Tully | 240,960 | 36,909 | 6·528 | 6·626 |
| Victoria | 221,616 | 33,938 | 6·530 | 6·626 |
| Macknade | 187,792 | 28,179 | 6·664 | 6·750 |
| Sugar—Local Sales | .. | 84 | .. | .. |
| Total for Northern District | 2,072,079 | 309,437 | 6·696 | 6·773 |
| Invicta | 87,360 | 13,984 | 6·247 | 6·245 |
| Pioneer | 157,701 | 23,225 | 6·790 | 6·152 |
| Kalamia | 178,749 | 26,104 | 6·848 | 6·165 |
| Inkerman | 192,729 | 26,391 | 7·303 | 6·486 |
| Proserpine | 151,450 | 23,217 | 6·523 | 6·371 |
| Cattle Creek | 83,044 | 12,049 | 6·892 | 6·581 |
| Racecourse | 177,593 | 26,609 | 6·674 | 6·648 |
| Farleigh | 180,640 | 26,534 | 6·808 | 6·815 |
| North Eton | 117,819 | 16,775 | 7·023 | 6·707 |
| Marian | 178,329 | 27,607 | 6·460 | 6·292 |
| Pleystowe | 184,717 | 28,274 | 6·533 | 6·451 |
| Plane Creek | 201,268 | 29,746 | 6·766 | 6·734 |
| Sugar—Local Sales | .. | 262 | .. | .. |
| Total for Central District | 1,891,399 | 280,777 | 6·736 | 6·457 |
| Qunaba | 89,132 | 12,236 | 7·284 | 7·823 |
| Millaquin | 190,952 | 27,640 | 6·909 | 7·475 |
| Bingera | 223,637 | 31,730 | 7·048 | 7·253 |
| Fairymead | 213,489 | 27,651 | 7·721 | 7·759 |
| Gin Gin | 57,116 | 7,268 | 7·859 | 7·733 |
| Isis | 188,316 | 28,466 | 6·615 | 6·963 |
| Maryborough | 58,427 | 7,948 | 7·351 | 8·027 |
| Mount Bauple | 44,076 | 5,872 | 7·506 | 7·929 |
| Moreton | 131,615 | 17,652 | 7·456 | 7·418 |
| Rocky Point | 18,500 | 2,303 | 8·033 | 8·350 |
| Eagleby | 2,018 | 207 | 9·749 | 10·389 |
| Sugar—Local Sales | .. | 259 | .. | .. |
| Total for Southern District | 1,217,278 | 169,232 | 7·193 | 7·475 |

*Price: 9d.*]

By Authority: A. H. TUCKER, Government Printer, Brisbane.